Department of Energy

SOCIAL IMPLICATIONS OF A WIND DRIVEN GENERATOR LOCATED IN A RESIDENTIAL AREA

CONTRACTOR REPORT

RENEWABLE ENERGY

SOCIAL IMPLICATIONS OF A WIND DRIVEN GENERATOR LOCATED IN A RESIDENTIAL AREA

Contractor

Milton Keynes Development Corporation

& University of Southampton

ETSU WN 5097-P1

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First published 1989.

THE SOCIAL IMPLICATIONS OF A WIND GENERATOR LOCATED IN A RESIDENTIAL AREA

SURVEY REPORT

The main findings described in this report result from a survey project to assess the impact on residents and passing drivers of the Wind Driven Generator located in the Energy Park, Milton Keynes.

This report has been prepared by the Survey Research Team of Milton Keynes Development Corporation who designed and managed the project.

The British Market Research Bureau Ltd were appointed to undertake fieldwork and data preparation for a large part of the project.

Funding for the Research was provided by the Department of Energy through the Energy Technology Support Unit, Harwell

February 1988

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MILTON KEYNES ENERGY PARK

The WDG is located within the Milton Keynes Energy Park. This Park is an area of the city that is being planned to combine all policies which promote energy efficiency and make practical use of new developments in energy and communications technology, drawing on the experience already gained in Milton Keynes.

The 300 acre site is being developed over a seven year period and comprises employment areas, housing, parkland and a range of community facilities including schools, shops and exhibition facilities. It will eventually house 3000 people and provide employment for about 2000.

There will be over 1200 housing units in the Park comprising private housing for sale, building plots, shared ownership housing and sheltered housing for the elderly. Size, price and design will vary considerably as with all new housing in Milton Keynes. Currently 300 houses have been completed and a further 300 are under construction.

Commercial development comprising 1,000,000 sq ft of industrial and commercial floor space will take place in the 80 acre Knowlhill employment area. This site is planned to provide high quality accommodation for over 50 businesses. Companies can either build their own accommodation or rent ready built energy efficient units built by the Development Corporation and private developers.

The three main objectives of the Energy Park are:

1. to enable residents and businesses to benefit from reduced energy costs and access to a range of modern Information Technology services;

2. to provide a high quality environment with unique investment opportunities;

3. to increase energy awareness and promote energy efficiency.

The energy policies which aim at reducing energy consumption by at least 30% fall into three areas - reducing levels of demand; providing efficient and secure energy supplies and providing energy management services.

Energy demand is being reduced at the planning stage by careful building design, road orientation, and landscaping. In order to ensure efficient energy performance in the area of building design, all buildings constructed in the Energy Park are required to meet a predetermined energy performance standard.

The focal point of the Energy Park will be the Energy Centre - an international, educational, information and exhibition centre catering for technical and educational visitors as well as other members of the public. The Centre is planned to include a Visitors and Interpretation centre, the Powerhouse - an exhibit in itself, as well as housing a number of energy exhibits; a Technical centre including trade exhibition areas, information and conference facilities; and public parkland with outdoor exhibits.

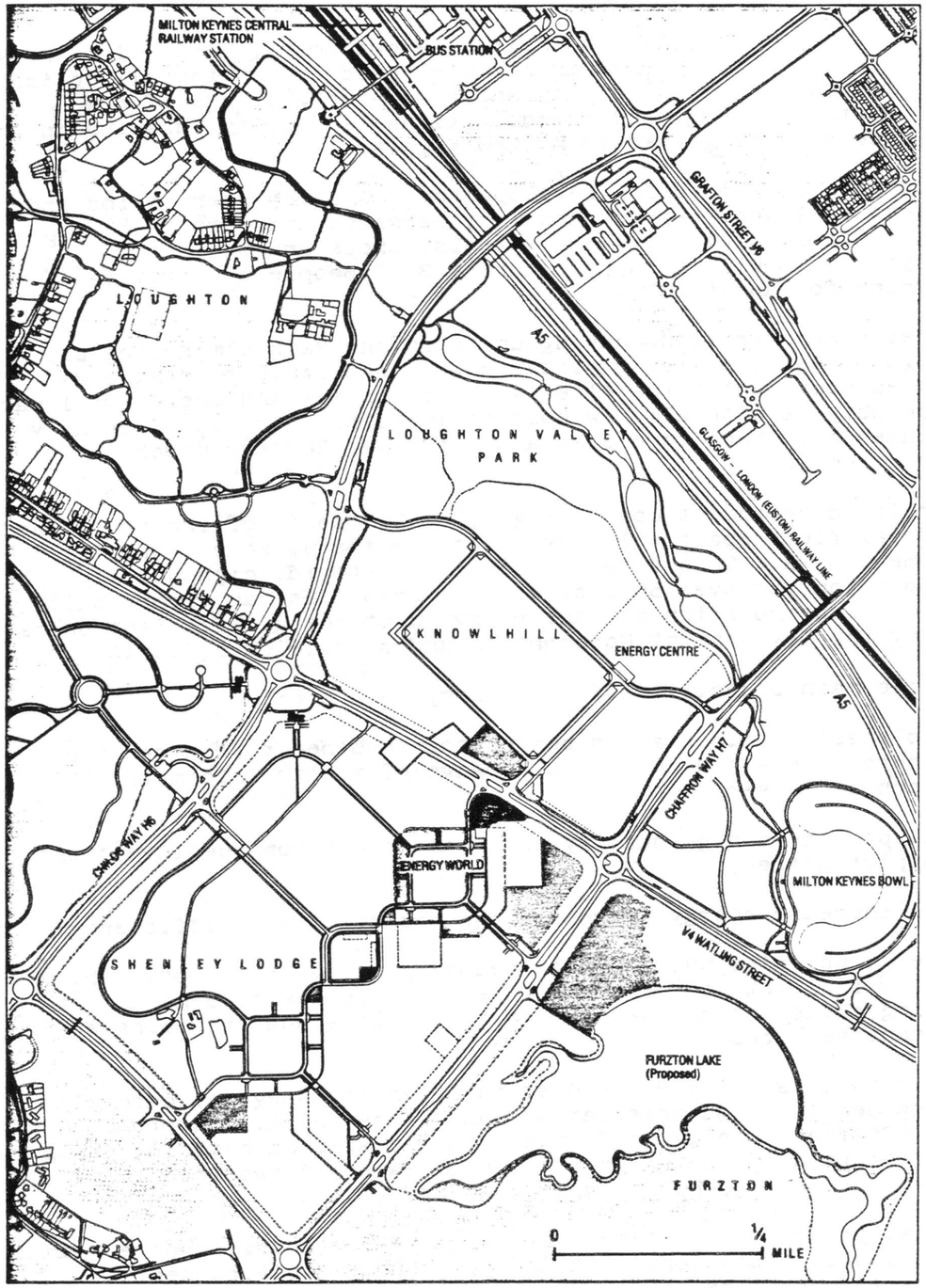


Diagram A-1. THE MILTON KEYNES ENERGY PARK

SOCIAL IMPLICATIONS OF A WIND DRIVEN GENERATOR IN A DOMESTIC SITUATION

INTRODUCTION

The purpose of this report is to present the main findings from a series of research investigations undertaken to monitor noise disturbance to local residents and the potential distraction to highway users of a wind driven generator (WDG).

The construction of the WDG in Milton Keynes, close to newly built housing in Shenley Lodge and adjacent to a major city thoroughfare (Watling Street V4), is a unique location designed to demonstrate the integration of technology in the domestic environment.

ISSUES AND OBJECTIVES

The research is designed to collect information on residents and drivers reactions/behaviour and to provide an assessment of the following issues:

1) The Suitability of Locating the WDG in Close Proximity to a Residential Area with regard to:

   a) visual intrusiveness for residents
   b) noise intrusiveness for residents

2) The Impact of a WDG Located Adjacent to a Major Thoroughfare focusing on:

   a) road-user behaviour
   b) drivers perceptions
   c) road safety

The objectives of researching these issues are threefold:-

- to provide a rational evaluation of the WDG's location in Shenley Lodge, Milton Keynes;

- to provide criteria for evaluating future sites for WDGs in a residential environment.

- to present a critique of the methodology used and develop further techniques for assessment of noise and intrusion factors of WDG's, where their proposed locaton is in a domestic environment.

METHODOLOGICAL SUMMARY

Three research methods were employed:

- Resident feedback. A survey consisting of face to face interviews with householders living on the Energy Park (ie., in Shenley Lodge and a small corner of Loughton grid squares).

- Driver feedback. A roadside interview survey of drivers passing the WDG site.

- Observational research. A survey consisting of observations of driver behaviour at the WDG site and its approaches.

The details of the research methods are presented and appraised in a supplementary technical report.

In addition, at the start of each of the main sections of this report, there is a short description of the approach taken.

1. SUMMARY OF RESEARCH FINDINGS

1.1 RESIDENT FEEDBACK

- Overall, residents have a very positive view of life in Shenley Lodge, appreciating its quietness and its appearance as well as the low heating costs of their homes. The main drawbacks are the lack of facilities and the amount of building work still going on at the time of interview.

- Unprompted, only 4% of residents mentioned the WDG as a problem.

- Only 7% of residents wanted the WDG taken away altogether, but a further 26% wanted it moved to a different place away from the houses.

- Noise is the main concern with the WDG. When asked directly, 23% of residents said they or their family were disturbed by the noise.

- Concerns about its safety were expressed by those living closest to the WDG, but generally it was thought to be safe for passing traffic.

- The noise produced by the WDG is considered to be continuous when it is operational and more likely to be described as 'whirring' or 'whining' by the 23% who were disturbed by it.

- The WDG is not generally thought to affect the value of property in Shenley Lodge and as many people thought the presence of the WDG would make their home easier to sell, as those who thought a sale would be more difficult.

- Those living nearest the WDG were asked what they had been told about the WDG before they moved in. Only 3 out of 39 residents were told anything by the selling agents.

1.2 SUBSET OF RESIDENTS (Households Living Within 130m)

- Residents within approximately 130m of the WDG (ie., those on Site E) are those most disturbed by it. Beyond 130m, levels of disturbance fall away quite sharply.

- Disturbance was reported by 10 out of 15 residents and the impact of the WDG is sufficiently serious that these 10 residents want the WDG moved.

- Worries about safety are held by 9 out of the 15 residents.

- Night-time noise disturbances are worse than day and evening but during the day and evening over half of the residents are disturbed.

1.3 DRIVER FEEDBACK

- A high proportion (67.1%) of the 965 drivers surveyed passed the WDG at least 2 to 3 times a week. Yet only 57% remember seeing the structure unprompted.

- After prompting, the WDG is noticed by 90% of drivers but they pay little attention to it.

- Half the drivers who noticed it could not recall which way it was pointing when they passed.

- 39% of drivers could not remember whether it was turning or not.

- 21% of drivers thought the WDG distracting and 19% thought it so distracting as to be the likely cause of an accident.

- 70% of drivers found the WDG a useful landmark.

1.4 OBSERVATIONAL RESEARCH

- The observed effect of the WDG on driver behaviour is marginal. Although as many as 68% of drivers 'notice' the WDG when operational, the observed effects on their behaviour were very limited.

- The observational research did not identify dangerous driver behaviour linked to any distraction caused by the WDG.

2. RESIDENTS FEEDBACK

2.1 APPROACH

A representative of each household living in Shenley Lodge was interviewed during June this year. This was either a householder or spouse/partner.

Five households from the south end of Loughton were also interviewed as they were considered to be within the Survey area.

The response rate was 75% with 108 achieved interviews (including 5 on Loughton). Data has been weighted to account for non-response. For most of the analysis Loughton residents have been excluded so that the results presented are the views of the population of Shenley Lodge, at the time of the Survey. Loughton residents have similar characteristics and views to the rest of the sample.

2.2 SAMPLE CHARACTERISTICS

2.2.1 Physical Aspects

Analysis of distance reveals the following coverage of the survey (including Loughton) (See Map 1):

4	4%	Distance Band 0 upto 25m (4 houses directly backing onto the WDG, Site E)
5	5%	Band 1, 25-60m; Site E
5	5%	Band 2, 60-130m; Site E,
21	19%	Band 3, 130-200; Site C, 1/1A, 2, G
30	27%	Band 4, 200-250m; Site C, 1/1A, 2, G,
21	18%	Band 5, 250-300m; Site 1/1A, 2, G, F
16	16%	Band 6, 300-370m; Site 4
6	7%	Band 7, 370-450m; Site J, Loughton

The sample covered the sites in the following way (See Map 2):

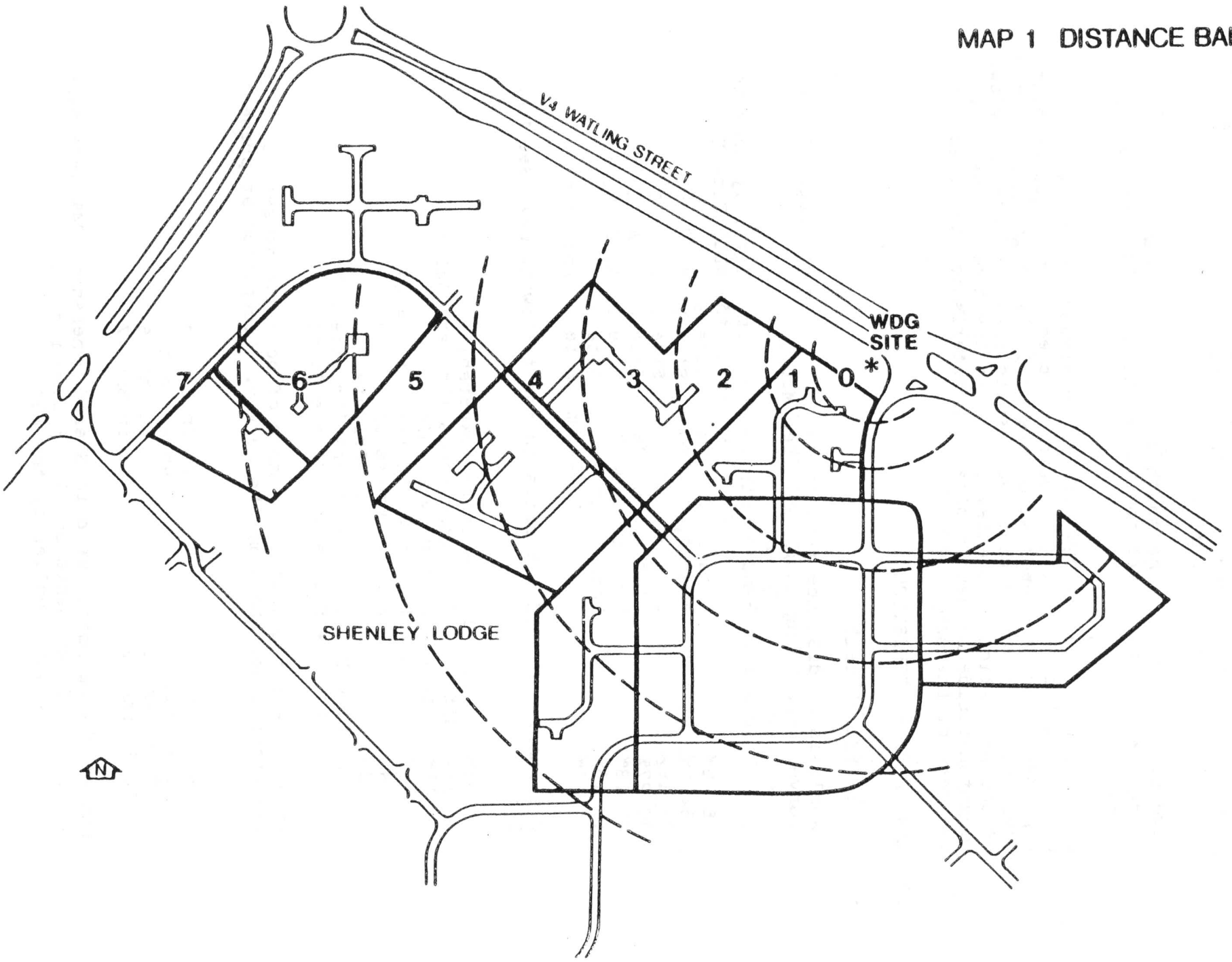
33%	on Site 1/1A - Shared Ownership
16%	Site E - Persimmon Homes (Private Sale)
16%	Site 4 - Shared Ownership
14%	Site C - Energy World (Private Sale)
14%	Site 2 - Shared Ownership
3%	Site G - Llewellyns (Private Sale)
2%	Site F - S & S Builders (Private Sale)
2%	Site J - Stepnell (Private Sale)

It must be noted that the number of occupied houses has increased since the time the survey. Occupation at present is:

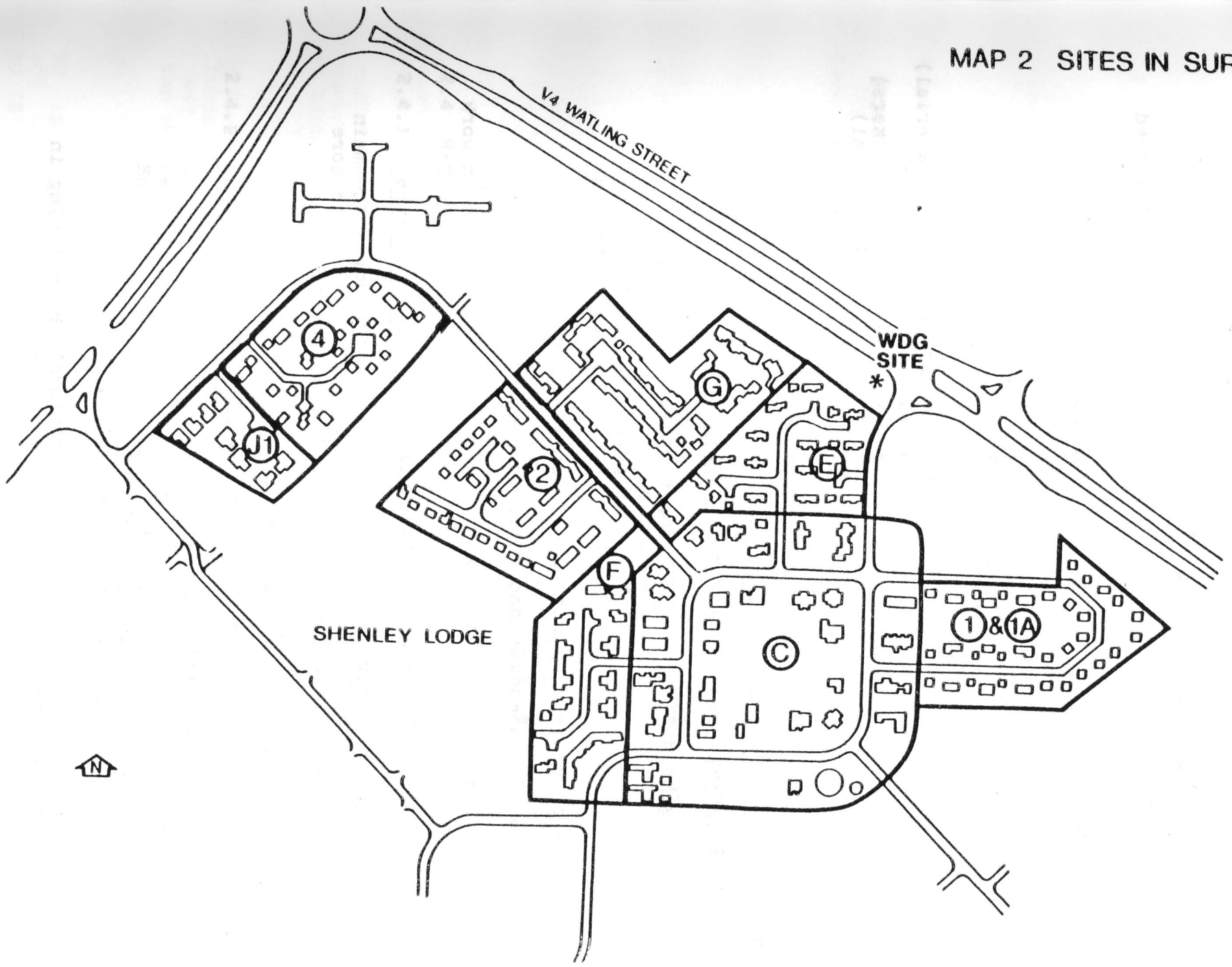
4 in Band 0	70 in Band 4
11 in Band 1	45 in Band 5
30 in Band 2	40 in Band 6
70 in Band 3	15 in Band 7

66% of the residents were in Shared Ownership, 34% were owner occupiers (2 residents on Site E occupied houses whose electricity was supplied by the WDG).

MAP 1 DISTANCE BANDS



MAP 2 SITES IN SURVEY



Particular attention has been paid to the answers given from those in distance bands 0, 1 and 2 combined. They are small in number but represent those households most affected by the WDG. (See Section 3 - Subset of Residents).

2.2.2 Individual Characteristics

The main characteristics of those individuals interviewed are:

Sex	51%	males
	49%	females
Age	60%	aged 16-34
	30%	35-54
	10%	55+
Social Grade	25%	B (Professional/Managerial)
	40%	C1 (Junior Non-Manual)
	18%	C2 (Skilled Manual Workers)
	10%	D (Semi-Skilled Manual)
	3%	E (Unskilled Workers)
	4%	(unclassified)

2.2.3 Household Characteristics

Main characteristics of households are:

Household Size	27%	single person households
	45%	two person households
	15%	three person households
	13%	four or more person households

9% of households contained a shift worker

21% of households had children present

The majority of couples/families had both partners in work (82%).

2.3 MOVING IN: CHOICE AND CONSIDERATIONS

As a general introduction and prior to introducing the main subject of the survey, residents were asked about the more general aspects of their move to Shenley Lodge.

2.3.1 Previous Place of Residence

56	54%	somewhere else in MK
10	10%	Buckinghamshire
4	4%	Bedfordshire
2	2%	Northamptonshire
13	12%	London/Greater London
6	6%	Elsewhere in the SE
12	12%	Elsewhere in Great Britain

Overall, 70% of residents had previously been living in Milton Keynes or its surrounding counties.

2.3.2 Reasons for Move

In particular, residents were asked why they moved house when they did.

41	40%	liked the houses/wanted a larger house or garden/wanted a newly built house.
22	21%	wanted to buy for the first time and/or were forming a new household.
20	19%	decided to move because of job relocation.
5	5%	got divorced/separated/needed smaller house.
5	5%	to be nearer friends/relatives
6	5%	increased standard of living/job opportunities
5	4%	given opportunity of this house/shared ownership
4	4%	didn't like previous area/liked this area/wanted to move back to this area.
4	4%	other answers

(Note: Some gave more than one reason).

2.3.3 Reasons for House Choice

Residents were asked specifically about the choice of the house they were living in. The main reasons given were design related and, from visiting the exhibition, an interest in energy efficient housing and value for money.

27	27%	selected for internal design considerations
23	22%	had visited the Exhibition - liked the houses - and wanted an energy efficient house
19	19%	selected house because they could afford it and/or value for money.
12	12%	wanted larger/detached house
5	5%	wanted a garden/bigger garden
21	20%	said they had very little or no choice at the time (¾ of these were share owners)

(Note: Some gave more than one reason).

2.4 SETTLING IN

2.4.1 Length of Time

Residents were asked how long they had been living on Shenley Lodge. This varied between 10 months and 2 weeks. It was found that length of time of living in Shenley Lodge made no significant difference to their answers about life in general.

2.4.2 Advantages of Living in Shenley Lodge

As part of the general introduction to the interview, residents were asked about the advantages of living on Shenley Lodge. Answers given were completely unprompted.

Main advantages

27	26%	quiet/private area
24	23%	near facilities
20	19%	pleasant looking estate
18	18%	near work
15	14%	low energy/heating costs
10	10%	close to countryside
7	7%	new estate
6	6%	friendly neighbourhood
9	9%	other advantages
19	18%	could think of no advantages to living in Shenley Lodge.

(Note: Some gave more than one advantage).

2.4.3 Disadvantages of Living in Shenley Lodge

In addition to the advantages, residents were asked about the problems they had experienced living in Shenley Lodge. Answers given were again completed unprompted. The purpose of this open ended question was to find out whether the WDG would be identified as a problem before it had been mentioned specifically by the interviewer.

Main Problems

56	54%	lack of facilities
32	31%	site/building incomplete
11	11%	building workers
7	7%	shops/schools long way away
6	6%	groups of visitors/no privacy
5	4%	aerogenerator/windmill
3	3%	internal house criticisms
2	2%	no road names
7	7%	other problems
17	17%	could not think of any problems

(Note: Some gave more than one problem).

Unprompted, only 4% (5 residents) mentioned the WDG as a problem - all living in developer housing on Site E (closest to the WDG).

More direct questions revealed that one of these 5 said that the WDG could be left where it was, 2 thought the WDG should be moved from its current position and 2 thought it should be taken away altogether.

2.5 INFORMATION FROM SELLING AGENTS ON WDG

The 39 residents on Site E, C and G were asked questions about what they were told about the WDG by the selling agents. The purpose of this was to see how well informed the residents had been before they chose their house.

2.5.1 Permanence of WDG

36 (92%) of residents stated that they were told nothing. Of the remaining three, one was told the WDG was permanent. The other two were told it would be moved by the summer of '87 or

within the next year. Two of these three residents specifically asked for information; the other couldn't remember.

Of those 36 who were told nothing 27 (74%) said they didn't have any idea how long it would be there when they moved in. The other 9 (26%) mainly thought it was to be a permanent feature.

2.5.2 Length of Time Working in a 24 Hour Period

It was found that residents were also not informed on the length of time the WDG would be operational. 38 people were told nothing, the other one was told, without asking, that the WDG would be working most or all of the time. 33 of the residents who were told nothing had no idea how long the WDG would be working during a 24 hour period. The other 5 mainly thought it would be working during the whole time period.

2.5.3 Conditions of WDG Turning

Only 3 out of 39 residents were told that the WDG would turn when conditions were suitable; others were told nothing at all and most had no idea about the conditions under which the WDG would turn.

One resident thought that it would turn only during the day, and one just during the night. Only one of those who was not told anything thought correctly that it would turn when conditions were suitable.

2.6 WDG's INFLUENCE OVER CHOICE OF HOUSE

The WDG was constructed in August 1986, before any houses had been sold. The majority of the residents had little recollection of the WDG.

When visiting Shenley Lodge and deciding to buy:

21	20%	said the WDG was working
52	50%	said the WDG was not working
30	30%	either didn't know or couldn't remember

In making their choice 92% (95 residents) did not consider the position of the WDG. Of the 8 residents who did consider this factor, only 2 said it affected their choice of house. One resident decided not to buy a house directly underneath the WDG but bought one in the middle of Site E. Another resident bought a house on Site F (at least 250m away from the WDG) in preference to one on Site E, within 130m of it.

2.7 MOVING OUT - FINANCIAL EFFECT OF WDG

Investigations were made to find out if residents views on the WDG were coloured by financial considerations.

2.7.1 House Value

Residents were asked whether the WDG was thought to affect the value of their property.

15	15%	WDG increases value
11	11%	WDG decreases value
70	68%	said it made no difference
7	7%	didn't know

Those disturbed by the WDG were more likely to say it decreased the value but 2 residents said it increased their house value.

9 of the 15 who said an increase in value was likely, thought it would be up to £2000 of extra value.

8 of the 11 who though a decrease in value was likely, believed it could be in the range of at least £500 and up to £5000 loss of value.

2.7.2 Ease of Selling

Residents were asked whether the WDG was thought to affect the ability to sell their property.

13	12%	thought it harder to sell
12	12%	thought it easier to sell
78	76%	said it made no difference

Those disturbed by the WDG were equally divided (43% each) between harder to sell and no difference.

The reasons of those who thought the presence of the WDG would make their house harder to sell, were divided between concerns about noise levels (59%) and a belief that the WDG is an eyesore (45%). Some give both reasons.

Of the 12 residents who thought it would be easier to sell, 10 gave the reason as being 'an energy saving idea'.

The attractiveness of the WDG was thought by a few to increase the value of their house and make it easier to sell. Conversely a few thought the ugliness of the WDG would make their house harder to sell and would lower the price.

2.8 OPINIONS ON VISUAL ASPECTS

Generally, the WDG was considered by residents to be an attractive landmark, with 52% agreeing with the statement that the WDG is an attractive landmark, 27% disagreeing (21% neither agreed nor disagreed).

The aesthetic qualities of the WDG were not regarded by most residents as an important factor when discussing the impact of the WDG on Shenley Lodge. However, the nearer the residents live to the WDG, the less likely they were to think it was an attractive landmark.

2.9 OPINIONS ON SAFETY

2.9.1 Estate Traffic

Residents were asked generally about road safety in Shenley Lodge. This was a completely open question with no mention

of any link between safety and the WDG. Dangers from traffic to pedestrians, children and cyclists on estate roads in Shenley Lodge were compared by the respondents 'perceptions' of road safety elsewhere in the city.

47	46%	less danger
10	10%	greater danger
28	27%	same amount of danger
18	17%	didn't know

Reasons were given for why they thought it was less dangerous in Shenley Lodge.

21	46%	said fewer people/cars
37	78%	said safe layout/traffic has to drive slowly
15	31%	said no-through roads

(Note: some gave more than one reason).

Reasons given for danger being greater were mainly due to contractors traffic and road layout. There was no mention of the WDG.

2.9.2 Passing Traffic

Residents were then asked to agree or disagree with the statement, "The aerogenerator is a hazard to passing traffic".

23	22%	agreed
74	72%	disagreed
6	6%	neither agreed nor disagreed

Of the 74 residents who thought the WDG was not a hazard to passing traffic, 41 were in strong disagreement. Whereas of the 23 who thought it was a hazard, only 5 were in strong agreement.

2.9.3 Safety of the WDG Structure

Residents were also asked specifically about the safety of the WDG structure itself. 24 residents, 23%, had concerns about whether the WDG was safe, 17% had never thought about it and 60% had no concerns. Of those concerned, 14 residents thought the blades might fly off, 6 residents worried that it wouldn't be properly maintained, 8 thought there might be problems in strong winds (mainly that it might fall down). (Note: some had more than one concern).

2.10 OPINIONS ON NOISE

2.10.1 Unprompted Awareness of Noise

When asked, generally and unprompted, about living on Shenley Lodge, 5 residents, 4%, stated that the WDG was a problem.

When 'disturbance' was introduced into the questions in its broadest terms, ie., meaning safety and visual aspects as well as noise, all residents interviewed took disturbance to mean just noise.

Respondents were also asked about opinions expressed by other members of their household. It was reported that 31 other members of households had expressed an opinion about the WDG.

16 were bothered by the noise it makes
7 said it looked ugly
6 said it was landmark
3 expressed concerns about safety
3 said it looks nice
3 made other comments

Noise is again the main concern.

2.10.2 Prompted Awareness of Noise

However, when prompted about whether the noise from the WDG ever disturbs themselves or their families, a substantial increase in the numbers disturbed was revealed.

24 23% disturbed
79 77% not disturbed

2.10.3 Distribution of Disturbed Households

Noise disturbance and distance from the WDG of the household, are related.

The critical distance is approximately 130m (refer to Section 3 for further details). Beyond 130m, levels of disturbance fall away quite sharply.

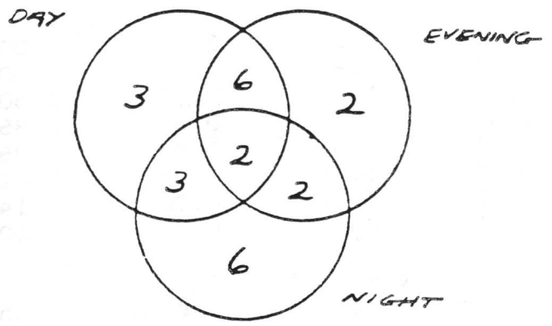
Distance from WDG	Disturbed		Not Disturbed		Sample Size
Less than 130m	10	67%	5	33%	15
More than 130m	14	16%	74	84%	88
All Respondents	24	23%	79	77%	103

2.10.4 Day/Evening/Night Disturbance

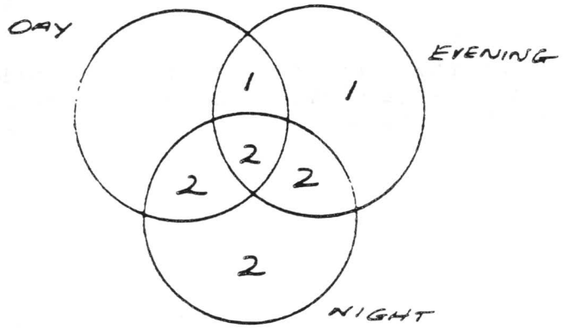
Of the 24 residents, 23% who were disturbed, further questions were asked about times of the disturbance.

14% said daytime 8am - 6pm
12% said evening 6pm - 11pm
13% said night 11pm - 8am

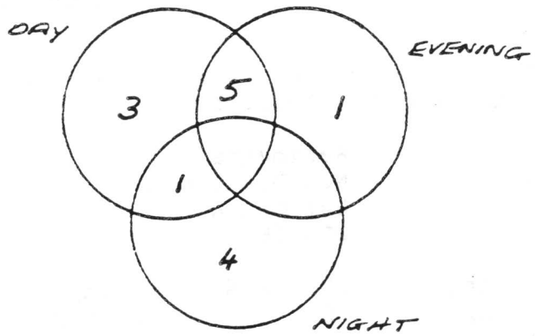
Combiningthese time periods reveals the true pattern of disturbance.



All residents
no. disturbed = 23%



Residents within 130m
no. disturbed = 67%



Residents over 130m away
no. disturbed = 16%

Residents reported a lot of disturbance, especially those living within 130m, and particularly at night.

2.10.5 Disturbed Living Conditions

All residents, regardless of whether they were disturbed by the noise, were then asked to comment on noise levels on the scale of 0-4 (0 = silent, 4 = very noisy). The different mean scores under varying conditions give a comparative assessment of levels of noise under certain conditions.

		Inside House				Outside
		Windows Open Day	Windows Open Night	Windows Closed Day	Windows Closed Night	In Garden
Distance Band						
Up to 25m	0	3.00	4.00	2.50	3.75	4.00
25m-60m	1	2.83	3.00	1.83	2.17	3.00
60m-130m	2	2.20	2.17	1.33	1.50	2.50
130m-200m	3	1.77	1.60	0.47	0.65	1.85
200m-250m	4	0.97	0.77	0.41	0.42	1.25
250m-300m	5	0.55	0.25	0.05	0.05	0.81
300m-370m	6	0.27	0.13	0.13	0.20	0.14
370m-450m	7	0.00	0.00	0.00	0.00	0.00

This evidence reinforces the argument that it is noise disturbance which lies behind residents desire to have the WDG removed, at least from its present location (see 2.11).

2.10.6 Definition of WDG noise

Residents were asked about the sort of noise the WDG made when it was turning. This was a prompted question where the residents were asked which words best described the noise made by the WDG

35	32%	Whirring
33	31%	Humming
24	22%	Swishing
23	21%	Whining
10	9%	Howling

(Note: some gave more than one answer).

Creaking, grinding, clanking, were each mentioned by 3% of residents or less.

The ranking changes when a distinction is made between those residents disturbed by the WDG and those not.

Residents Disturbed (24)			Residents Not Disturbed But Could Hear WDG (50)		
14	61%	Whirring	27	32%	Humming
12	49%	Whining	20	24%	Whirring
11	45%	Swishing	14	16%	Swishing
7	29%	Howling	11	13%	Whining
6	27%	Humming	3	3%	Howling

(Note: some gave more than one answer).

The 24 residents who were disturbed by the WDG were asked exactly what disturbed them.

5	22%	when it started up
16	68%	all the time
3	10%	didn't know

Disturbance was also reported to be caused mainly by a constant wearing noise. It interrupted sleep and interfered with enjoyment of the garden.

2.10.7 Expectations of Noise

All the residents were asked if they found the level of noise was as they expected before they moved in. Half of the residents hadn't thought about it. Of the 51% (53 residents) who had any expectations, half found the level of noise worse than expected.

14	26%	found it much worse
13	24%	slightly worse
16	30%	as expected
6	12%	slightly better
4	8%	much better

Those living closest to the WDG generally found the level of noise to be worse than expected.

2.11 POSITIONING OF THE WDG

All residents of Shenley Lodge were asked their opinions on what should happen to the WDG.

67	63%	said it should be left where it is
26	26%	said it should be moved to a different place
7	7%	said take it away altogether
4	4%	didn't know

3. SUBSET OF RESIDENTS

3.1 DEFINITION OF THOSE DISTURBED

It is evident from the previous section that the main distinguishing factor between residents who are disturbed by the WDG and those not, is the relative proximity of their house to the site of the WDG. There are however, residents who do not fit the pattern. For example, two residents who stated that they were disturbed by the WDG are living in the furthest distance bands from it and five residents who are not disturbed by the WDG live within 130m of it.

Location within		Disturbed By WDG	Not Disturbed
(Up to 130m)	(Band 0	4	-
	(1	4	2
	(2	2	3
	3	6	13
	4	6	23
	5	-	20
	6	1	14
	7	1	5

3.2 CRITICAL DISTANCE

Looking at answers to various questions by distance bands, it was shown that the critical distance included bands 0, 1 and 2 (approximately 130m away from the WDG site). Bands 3 or more showed a significant reduction in reactions to the WDG.

3.3 PROFILE OF RESIDENTS BY DISTANCE

3.3.1 Distance Band 0, Up to 25m

(4 houses backing directly on to the WDG).

- Of the four respondents, 2 are males and 2 are females;
- All are of working age with three working full-time and one who is not working;
- Of the four households represented, two are single people and two are couples;
- One of the four respondents is a shift worker;
- All four respondents want the WDG moved and all state they are very disturbed by it.

3.3.2 Distance Band 1, 25m - 60m

- Of the six respondents, three are male and three are female;
- All are of working age and are in full-time work;
- Two of the households are single people, the other four are couples;

- Four of the respondents say they are disturbed by the WDG and the same proportion want the structure should be moved.

3.3.3 Distance Band 2, 60m - 130m

- Of the five respondents, four are male and one is female;
- All the respondents are in full-time work;
- Two of the respondents state that the WDG disturbs them;
- Three say the WDG should be moved and the other three that it should stay.

3.4 SUBSET RESIDENTS ATTITUDES

Since Site E is covered only by bands 0, 1 and 2, it is Site E residents who are considered as the subset (15 residents at the time of the survey). It should be noted that 45 houses are at present occupied in this area.

3.4.1 Unprompted Awareness

Unprompted, 5 subset residents said that the WDG was a problem with living on Shenley Lodge. The 5 who mentioned the WDG are the only 5 in the whole sample. Otherwise the subset held similar opinions about life in Shenley Lodge as the rest of the residents.

3.4.2 Moving In - Choice and Consideration

When deciding which house to buy, 6 respondents said they had considered the position of the WDG and 9 that they had not.

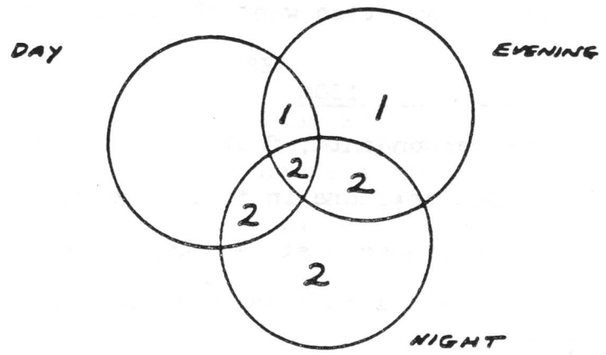
Of those 6 who had considered it, only one said it had affected their choice.

3.4.3 Information from the Selling Agents

13 of the respondents said that the selling agents had told them nothing. Two respondents had specifically asked for information. One was told it would be permanent and one that it would be moved in a year. Information about the hours of working of the WDG was just as sparse. 13 residents had no idea how long it would be working. One thought it would turn only during the day and only one resident had the correct understanding when they bought their house.

3.4.4 Disturbance

Of the 15 residents, 10 stated that they are disturbed by the WDG.
Levels of noise disturbance are greatest at night. Over half of the subset are disturbed during the day and/or evening.



Two thirds of the subset said the noise was worse than expected. The noise was also worse at night, in the gardens and with windows open (see bands 0, 1 and 2 in section 2.10.5). Five residents complained that the noise of the WDG disrupts sleep and 2 complained of the noise when sitting in the garden.

Two residents also described the WDG as 'very noisy' when it starts up.

3.4.5 Safety of the WDG

The subset are of mixed opinion, with some quite worried about the safety of the WDG structure. Six said the blades might fall off, 2 that the whole thing might fall down in high winds and 3 that it is not properly maintained.

3.4.6 Positioning the WDG

Ten of the 15 respondents want the WDG moved, whilst the remaining 5 were happy simply to leave the WDG where it is. Four just wanted it moved 'miles away', 3 wanted it located next to the houses which benefitted from it and 3 suggested a location on the other side of the road (V4 Watling Street).

Noise considerations were the main reasons given by those wanting to move the WDG, although 2 people were concerned enough about safety to suggest moving it.

3.5 SUMMARY OF SUBSET

Residents within approximately 130m of the WDG are those most disturbed by the WDG. Beyond 130m, levels of disturbance fall away quite sharply. Within 130m, noise disturbance levels are appreciable and safety is a major cause for concern.

Night time noise disturbance is worse than day or evening but during the day and evening over a half of the subset are disturbed.

The impact of the WDG is sufficiently serious that 10 of the 15 respondents want it moved.

4. DRIVER FEEDBACK

4.1 APPROACH

Two roadside interview stations were set up on the V4 (Watling Street). A total of 972 vehicles were stopped during the roadside survey period. Of these 965 (99%) gave interviews.

Excluded from the survey were vehicles such as emergency service vehicles, buses, funeral processions and cycles. Also excluded were wide load vehicles which could not be accommodated safely in the survey bays.

4.1.1 Vehicle Types

The 965 vehicles surveyed are categorised as follows:

796	82%	Cars
105	11%	Vans
46	5%	Lorries
16	2%	Motorcycles/Mopeds
2	-	Others

Drivers interviewed were asked for infomation on the origin and destination of their journeys and the purpose of their trip. Information on the time of day, number of occupants and vehicle type was also collected by the interviewer as the vehicle was stopped in the interview bay.

4.1.2 Direction of Flow

Interviewing took place on three days, and the number of complete interviews achieved in each direction were as follows:

	Northbound Carriageway	Southbound Carriageway	Total
Tue 14 July (3pm-7pm)	-	211	211
Thurs 16 July (7am-11am)	168	224	392
Sat 18 July (9am-1pm)	201	161	362
	369	596	965

Northbound traffic was not interviewed on the 14th July and the interview station was not in position. The purpose of this was to identify what impact, if any, the position of the northbound interview station had on the answers of southbound drivers. The northbound station was set up fairly close to the WDG and it could have served to draw the attention of southbound drivers to the WDG.

A comparison of the southbound interviews on the 14th July with those of the 16th (another week-day) revealed little difference in answers. The effect of the northbound station can therefore be discounted.

4.2 GENERAL CHARACTERISTICS

4.2.1 Occupancy Rates

Overall, the number of occupants per vehicle were found to be:

548	57%	one occupant
277	29%	two occupants
79	8%	three occupants
55	5%	four+ occupants
6	-	not recorded

Levels of vehicle occupancy varied significantly between the weekdays and the Saturday of the survey:

No. of Occupants	Weekdays		Saturday	
One	397	66%	151	42%
Two	147	24%	130	36%
Three	38	6%	41	11%
Four +	16	3%	39	11%
Not Recorded	5	1%	1	-
	603		362	

Compared with the Saturday sample, 24% more vehicles in the weekday sample had only one occupant. 22% of the Saturday sample had three or more occupants which is more than twice the proportion of the weekday sample.

4.2.2 Journey Profile

87% of the journeys were local (that is with an origin and destination stated as being within Milton Keynes city).

Frequencies of journeys passed the WDG were reported by drivers:

Daily	52%
2/3 times a week	15%
Weekly	11%
Monthly	5%
Rarely	9%
For the 1st time	3%
Other definitions	5%

The purpose of the journey was given by drivers.

23%	Going home
41%	Going to work
5%	Other business
19%	Domestic eg shopping, collecting children, school/college.
4%	Visiting friends/relatives
5%	Other leisure/recreation related journeys
3%	Other reasons.

In summary, it is clear that most of the traffic is fairly regular and mostly local and the majority of drivers are familiar with this stretch of road.

4.3 WDG INTRUSION

4.3.1 Driver Recollection

Drivers were asked a series of question to ascertain whether the WDG was a noticeable feature. **"Have you seen any unusual looking structures in the last half mile?".** If the WDG was not mentioned then they were asked: **"Did you see a windmill-type structure?".** If this was a negative, a final attempt to prompt was made: **"Have you ever seen it?"**

The aim of these questions was to establish how many drivers would mention the WDG without being asked directly, and how many would recall the WDG when prompted. Drivers who could not recall the WDG even when prompted were not asked any further questions. 28 drivers had no recollection of the WDG and their interview was terminated.

Therefore, for the questions relating to the WDG the effective number of interviews was reduced to 937. The 28 drivers eliminated had very similar characteristics to the rest of the sample, with 6 of them passing the WDG daily or 2/3 times a week.

Of the 937 drivers who had seen the WDG, 537 (57%) mentioned the WDG unprompted, 400 (43%) needed further prompting.

The two categories of drivers have very similar sample and journey characteristics - there was no difference between vehicle type or number of occupants.

Those travelling daily were just as likely to need prompting as the rest of the sample. Similarly the purpose of journey had no particular relationship with unprompted awareness.

4.3.2 Drivers Who Had Seen the WDG

Those drivers who stated they had seen the WDG on that particular journey were shown a set of 4 photographs depicting various views of the WDG (depending on which way the blades would appear on the approach) and were asked the following:

"Can you remember which way it was facing as you drove towards it?"

"Was it going round?"

The questions were designed to qualify their previous answers and to gauge how much notice they actually took of the WDG.

Half of the drivers did not know and could not be pressed to make a choice of photograph. So that, although these drivers were aware of passing it, a large number had not really noticed the WDG and did not know which way it was pointing.

For the other half of the drivers the results were inconclusive, all 4 photographs were picked regardless of the WDG's true position. There was no discernable pattern in the results between the days of the survey, type of vehicle, north or south direction.

The photographs proved to be very open to personal interpretation.

The more frequent the journey, the less the drivers could offer an opinion on the way the WDG was pointing.

Frequency of Journey	No Knowledge of Direction of WDG
Daily	60%
2/3 time a week	54%
Weekly	47%
Monthly	22%
Rarely	21%
1st time	17%

On the other hand, and as might be expected, drivers who spontaneously said they saw the WDG, noticed it more that the drivers who were prompted.

When asked whether the WDG was turning, a high proportion of drivers could not remember. In context the WDG was only turning for a few minutes during the survey periods.

28	3% believed it was turning
514	58% said it was not turning
343	39% did not know

12% of drivers passing it for the 1st time thought it was turning, as opposed to 3% of other drivers.

36 drivers attempted to turn around to look at the WDG when answering this question. Their answers are included.

4.3.3 Noticeability

Drivers who had seen the WDG previous to the day of the survey were asked to make a comparison.

"Compared with when you first saw it, do you think the windmill is now:

More noticeable
Less noticeable
About the same

or

No longer noticeable"

More noticeable	10%
About the same	46%
Less noticeable	21%
No longer noticeable	23%

	NOW			
When First Saw WDG	More Noticeable	About the Same	Less Noticeable	No Longer Noticeable
1 week ago	15%	54%	8%	23%
Last Month	17%	66%	3%	14%
2-3 Months Ago	18%	39%	21%	22%
4-6 Months Ago	12%	48%	21%	19%
7-12 Months Ago	8%	48%	22%	22%
Over a Year Ago	7%	43%	24%	26%

The percentage of drivers saying that the WDG is more noticeable now, lessens as the length of time over which they are making a comparison gets longer, ie., it gets less noticeable with time.

Also the more often the WDG was passed, drivers were more likely to say it is no longer noticeable.

	NOW			
	More Noticeable	About the Same	Less Noticeable	No Longer Noticeable
Daily	10%	42%	21%	27%
2-3 a Week	10%	48%	21%	21%
Weekly	8%	53%	24%	15%
Monthly	7%	61%	17%	15%
Rarely	18%	51%	19%	12%

No other differences were apparent in answers to this question.

4.3.4 Distraction to Drivers

Drivers were asked whether they agreed or disagreed with the following statement.

"Some people think that the windmill structure is a distraction for drivers".

6% agreed and thought it very distracting.
15% agreed and thought it quite distracting.
77% disagreed - not distracting.
2% Dont know.

There is no overall difference between the opinions of drivers on weekdays and Saturdays but some difference emerged between northbound and southbound drivers.

	Northbound	Southbound
Very distracting	4%	7%
Quite distracting	14%	16%
Not distracting	81%	75%
Don't know	1%	2%

This north/south difference is accentuated when looking at the results from just the interviews on the Saturday:

	Saturday North	Saturday South
Very distracting	3%	12%
Quite distracting	15%	18%
Not distracting	80%	69%
Don't Know	2%	1%

No other differences in drivers perceptions of the WDG emerged. Frequency of passing the WDG did not affect the answers to whether it was thought to be a distraction or likely to cause road accidents.

4.3.5 Road Accidents

Drivers were also asked their opinion ofthe WDG as a cause of accidents.

"Do you think it likely or unlikely that the windmill will cause accidents"?

19% thought it likely
80% thought it unlikely
1% did not know

There is no difference in the answers given from north or south bound drivers.

Those who thought the WDG is likely to cause road accidents are not always the same drivers who think it a distraction.

Distraction of WDG	Cause Road Accidents		
	Likely	Unlikely	Don't Know
Very Distracting	75%	23%	2%
Quite Distracting	48%	49%	4%
Not Distracting	9%	90%	1%

4.3.6 Danger to Passing Traffic

Drivers were asked a further question to ascertain their perceptions of the WDG's impact on road users.

"Would you say the windmill is a danger to traffic"?

121 13% said yes
813 87% said no
3 - don't know

Again characteristics of drivers who said 'yes' and those who said 'no' are very similar.

The table below shows the difference between those who thought it a danger, and those who thought it likely to cause road accidents and those who thought it a distraction.

		Danger to Passing Traffic	Not a Danger to Passing Traffic
Road Accident	- Likely	57%	43%
	- Unlikely	3%	97%
Distracting	- Very	74%	26%
	- Quite	31%	68%
	- Not Distracting	5%	95%
		(121)	(813)

4.3.7 Aesthetic Opinions

Apart from perceptions of safety and distraction issues, drivers were asked two questions on the aesthetic qualities and usefulness of the WDG.

"Would you say the windmill is:

.. a useful landamark for drivers?
.. ugly to look at?"

70% said it was a useful landmark
29% not a useful landmark
1% don't know

There was a small difference between north and southbound traffic.

	North	South
Useful landmark	75%	67%
Not useful	25%	32%
Don't Know	-	1%

27% thought the WDG was ugly to look at
73% though that it was not ugly

Again, a difference is shown between north and southbound drivers.

"the WDG is ugly to look at?"

	North	South
Ugly	22%	30%
Not ugly	78%	70%

Although only about a quarter of car drivers think it is ugly, they are more likely to think this than van and lorry drivers.

4.4 SUMMARY

A high proportion of the 965 drivers surveyed (67.1%) passed the WDG at least 2/3 times a week. Yet only 57% remember seeing the structure, unprompted. 28 drivers had no recollection of it whatsoever. It is apparent that the WDG is noticed but with little attention paid to it. Half the drivers who said they noticed it could not recall which way it was pointing. 39% of drivers could not remember if it was turning or not. The WDG was regarded as being increasingly less noticeable as the numbers of journeys passed it increased.

21% thought the WDG to be distracting and 19% thought it so distracting as to be the likely cause of an accident. On the other hand, 70% found it a useful landmark and 73% did not find it aesthetically unattractive.

5. OBSERVATIONAL RESEARCH

5.1 APPROACH

This component of the research investigated the possibility of a link between driver behaviour and distraction caused by the WDG. The observational research complemented the information provided directly by drivers in the roadside interviews. Together they helped test the hypothesis that the WDG could be "the cause of road accidents" along that part of the V4.

The results from the research need to be assessed in the light of recorded accident figures for the relevant stretch of the V4. In the two years previous to the study, no accidents had been recorded.

Observations were made on three successive weekdays in August. The observations were used to determine the nature of, and extent to which vehicle drivers are distracted by the WDG. The level of erratic behaviour was compared with a control section of road.

The approach consisted of recording vehicle type, speed, direction, number and type of passengers, any erractic driving movements and, wherever possible, adverse head and eye movements/gesticulations. The observation posts were on both sides of the V4, at unobtrusive locations immediately to the south and north of the WDG. The WDG was only operational during part of the exercise.

In total, 4,350 effective driver observations were obtained, covering both northbound and southbound traffic.

5.2 WDG SITE LINES

Map 3 shows the location of the WDG in relation to the road features described below. The WDG has a relatively short period of viewing for drivers travelling south on the V4. For these drivers, the WDG is passed on their side of the vehicle. Drivers coming from CMK have a long distance view of the WDG, some 200-300m before reaching roundabout 'B'.

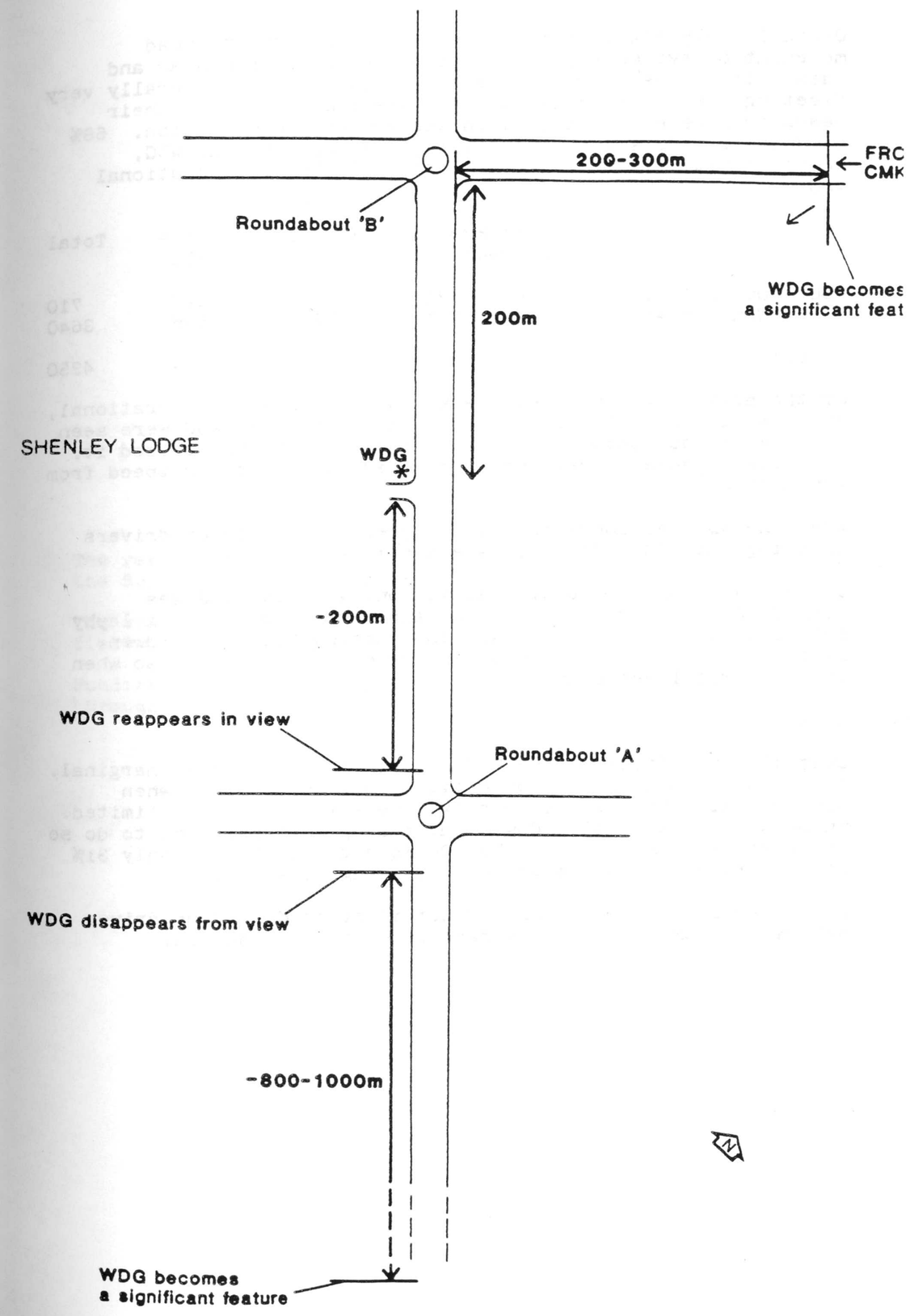
The WDG is in view from the south about 1000m away from it, along the V4. However, it disappears from view as roundabout 'A' is approached and only 'reappears' within 100 to 200m of its location.

5.3 SAMPLE CHARACTERISTICS

Vehicle types passing the observation positions were as follows:

80% cars
10% vans
4% lorries
3% motor cycles/mopeds
3% other vehicles
(4,350 effective observations)

MAP 3 LOCATION OF WDG



5.4 MAIN FINDINGS

Overall, only 37% of drivers were seen to make any head movement or eye contact with the WDG as they drew near and passed it. These movements and eye contact were generally very fleeting. However, drivers were more likely to move their heads or make eye contact when the WDG was in operation. 68% of drivers made signs of 'noticing' the operational WDG, compared with 31% of drivers 'noticing' the non-operational WDG.

	Head/Eye Contact		No Visible Signs of Noticing WDG		Total
WDG - Operational	483	68%	227	32%	710
- Non-Operational	1128	31%	2512	69%	3640
Overall Total	1611	37%	2739	63%	4350

Of the drivers who noticed the WDG when it was non-operational, only 14 (1%) actually slowed down their vehicles and were seen to 'take a good look' at the aerogenerator as they passed it. On average these drivers were observed to drop their speed from 40mph to 25mph.

When the WDG was operational, a higher proportion of drivers noticing the WDG, 12% (58) made a similar response.

On one two hour period of observation, when the WDG was operational, 3 cars, a motorbike and a van stopped in a layby for about 3 minutes each. All the cars contained children. Cars slowing down and/or stopping were observed to do so when the road was least busy.

5.5 SUMMARY

Overall, the effect of the WDG on driver behaviour is marginal. Although, as many as 68% of drivers 'notice' the WDG when operational, the effects on driver behaviour are very limited. Those who actually slow down and/or stop were observed to do so at less busy times. When the WDG is not operational only 31% of drivers showed any signs of 'noticing' the WDG.

The observational research did not identify dangerous driver behaviour linked to any distraction caused by the WDG.

THE SOCIAL IMPLICATIONS OF A WIND GENERATOR LOCATED IN A RESIDENTIAL AREA

METHODOLOGICAL REPORT

The research described in this report was designed and managed by the Survey Research team of Milton Keynes Development Corporation.

The British Market Research Bureau Ltd were appointed to undertake fieldwork and data preparation for a large part of the project.

Funding for the Research was provided by the Department of Energy through the Energy Technology Support Unit, Harwell.

February 1988

CONTENTS

MILTON KEYNES ENERGY PARK

The WDG is located within the Milton Keynes Energy Park. This Park is an area of the city that is being planned to combine all policies which promote energy efficiency and make practical use of new developments in energy and communications technology, drawing on the experience already gained in Milton Keynes.

The 300 acre site is being developed over a seven year period and comprises employment areas, housing, parkland and a range of community facilities including schools, shops and exhibition facilities. It will eventually house 3000 people and provide employment for about 2000.

There will be over 1200 housing units in the Park comprising private housing for sale, building plots, shared ownership housing and sheltered housing for the elderly. Size, price and design will vary considerably as with all new housing in Milton Keynes. Currently 300 houses have been completed and a further 300 are under construction.

Commercial development comprising 1,000,000 sq ft of industrial and commercial floor space will take place in the 80 acre Knowlhill employment area. This site is planned to provide high quality accommodation for over 50 businesses. Companies can either build their own accommodation or rent ready built energy efficient units built by the Development Corporation and private developers.

The three main objectives of the Energy Park are:

1. to enable residents and businesses to benefit from reduced energy costs and access to a range of modern Information Technology services;

2. to provide a high quality environment with unique investment opportunities;

3. to increase energy awareness and promote energy efficiency.

The energy policies which aim at reducing energy consumption by at least 30% fall into three areas - reducing levels of demand; providing efficient and secure energy supplies and providing energy management services.

Energy demand is being reduced at the planning stage by careful building design, road orientation, and landscaping. In order to ensure efficient energy performance in the area of building design, all buildings constructed in the Energy Park are required to meet a predetermined energy performance standard.

The focal point of the Energy Park will be the Energy Centre - an international, educational, information and exhibition centre catering for technical and educational visitors as well as other members of the public. The Centre is planned to include a Visitors and Interpretation centre, the Powerhouse - an exhibit in itself, as well as housing a number of energy exhibits; a Technical centre including trade exhibition areas, information and conference facilities; and public parkland with outdoor exhibits.

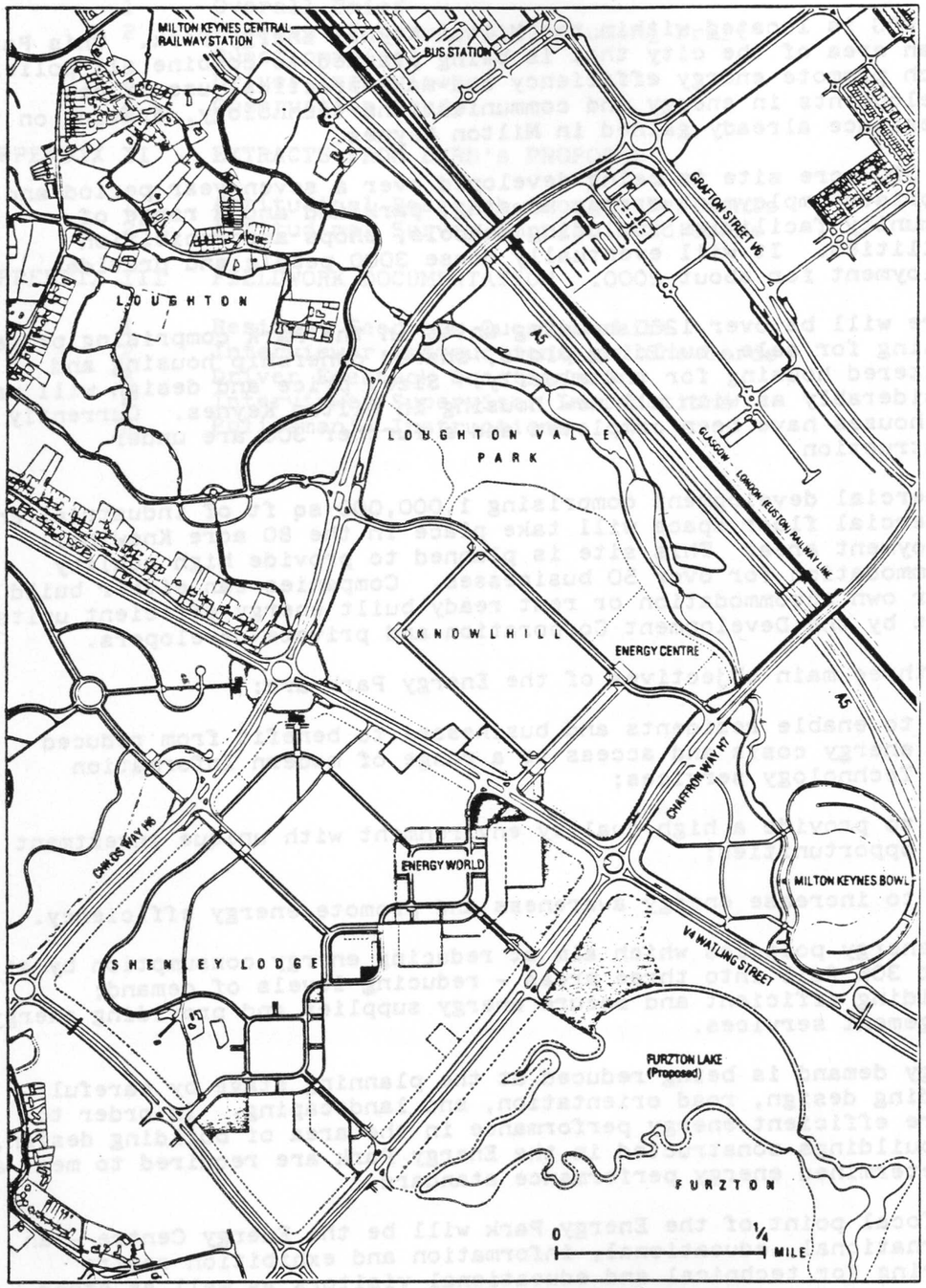


Diagram A-1. THE MILTON KEYNES ENERGY PARK

SECTION 1 BACKGROUND AND OBJECTIVES

1.1 INTRODUCTION

The Survey Research Group of Milton Keynes Development Corporation was commissioned to investigate the "social effects" of the Wind Driven Generator located in Shenley Lodge. This report describes the methodology employed for the investigation.

1.2 CONTEXT

The construction of the WDG in the Energy Park, Milton Keynes, close to newly built housing in Shenley Lodge and adjacent to a major city thoroughfare (Watling Street V4), is a unique location designed to demonstrate the integration of technology in the domestic environment.

The map on the preceding page shows the location of Shenley Lodge and the adjacent grid squares.

1.3 OBJECTIVES

The purpose of the research was to investigate noise disturbance for local residents and the potential distraction to highway users of a wind driven generator (WDG). The research was complementary to the physical monitoring of the WDG undertaken by the Noise and Vibration Control Unit at Southampton University.

The research findings from the "social" monitoring exercise are presented in a separate report. They provide:

a) a rational evaluation of the WDG's effect in Shenley Lodge

b) criteria for evaluating future sites for WDG's in a residential environment

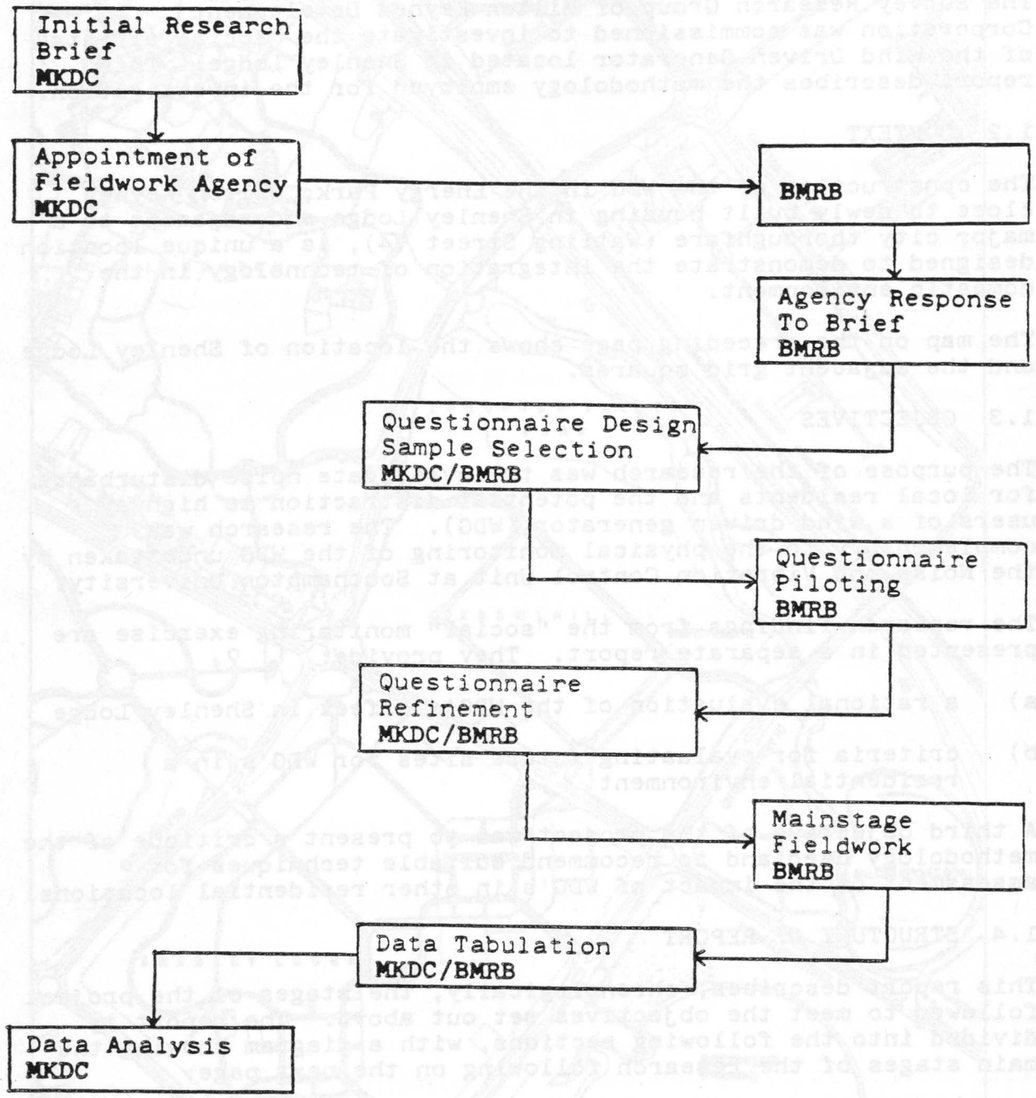
A third objective of the project was to present a critique of the methodology used and to recommend suitable techniques for assessment of the impact of WDG's in other residential locations.

1.4 STRUCTURE OF REPORT

This report describes, chronologically, the stages of the project followed to meet the objectives set out above. The report is divided into the following sections, with a diagram showing the main stages of the research following on the next page:

* The initial brief and appointment of Research Agency - (Section 2)
* Refinement of Research Design - (Section 3)
* The Fieldwork - Section 4)
* Analysis - (Section 5)
* Evaluation of Methodology - (Section 6)

MAIN STAGES OF PROJECT



SECTION 2 - THE INITIAL BRIEF AND APPOINTMENT OF AGENCY

2.1 OVERALL APPROACH

MKDC drew up the initial brief for the project. This defined the design for the research, reflecting the overall objectives for the project. The brief was written for outside research agencies who would be asked to tender to undertake the fieldwork and data preparation.

There were three separate components to the work and each had their own 'mini brief'. The three were:

i) Resident Feedback (from residents in the immediate vicinity of the WDG);

ii) Driver Roadside Feedback (from users of the adjoining main road);

iii) Observation Study of Driver Behaviour

2.2 THE BRIEF

Appendix I contains the detailed briefs for each study produced by MKDC. Their contents can be summarised as follows:

i) Resident Feedback

* method - 20-30 minute face-to-face interview;
* sample design;
* guidelines on fieldwork requirements (including importance attached to pilot survey);
* draft questionnaire and description of approach to questionnaire design;
* format for results;
* timetable.

ii) Driver Roadside Feedback

* method - 2 minute face-to-face interview of drivers at selected interview stations;
* sample design and sampling technique;
* role of pilot study;
* guidelines on interview timings;
* draft questionnaire (suggested questions listed);
* format for results;
* requirements for liaison with police.

iii) Driver Observation Study

* detailed description of proposed method;
* format for results
* timetable

2.3 SELECTION OF THE MARKET RESEARCH AGENCY

From the outset, it was decided that the observation study would be undertaken directly by the Survey Research Team. This reflected the experimental nature of the work.

The other two components were brought together in a single brief which was sent to three market research agencies. The three were selected for their suitability and experience in the social research field.

In selecting the agencies invited to tender, emphasis was placed on their ability to undertake residential survey work. The roadside driver interviews, although shorter and more straightforward, were complex to administer and required considerable liaison with local police. MKDC's survey research team were confident that their experience in project management would be sufficient to guide an agency whose experience was greater in residential feedback.

After discussions on the technical and practical aspects of the brief with all three agencies, one was appointed. The British Market Research Bureau Ltd (BMRB) were the most suitable in terms of the criteria set by Milton Keynes Development Corporation's Survey Research Team, eg., costs, value for money, ability to perform, track record, evidence of comprehending proposal.

SECTION 3 - REFINEMENT OF RESEARCH DESIGN

3.1 THE PROCESS

Following the agency appointment, detailed discussions between BMRB and MKDC provided practical proposals for the fieldwork and data preparation.

BMRB's tender set out their approach to the fieldwork and data preparation. The proposal included a discussion of certain aspects of the brief and suggestions for alternative methods for the research. (Appendix II sets out extracts from BMRB's proposal).

The remainder of this section describes the major changes made to the brief for the Residential and Driver Roadside studies between the times of BMRB's appointment and commencement of the main stage of fieldwork.

3.2 TIMING OF RESIDENTIAL AND DRIVER STUDIES

Initially, the research was programmed for fieldwork in April with results in June. However:

* The WDG had operational problems up to, and including, March and was not rotating under appropriate conditions.

* The number of occupied houses during the proposed survey time was over-estimated. A few months delay increased the number of occupied dwellings and provided an adequate sample size.

The project was retimed for June/July with data available from the agency in August/September.

3.3 RESIDENTIAL STUDY

i) Sample

The brief set a sample of all occupied dwellings in the site nearest the WDG and a 1 in 2 sample of other occupied dwellings in Shenley Lodge. In addition, 27 dwellings in the adjoining area of Loughton, and nearest the WDG, were to be issued. This totalled an estimated 168 addresses.

Even by the time of the rescheduled fieldwork, the original sample of 168 addresses could not be met. Instead, an approach to every occupied dwelling in Shenley Lodge resulted in 103 achieved interviews (a 75% response rate). Only 5 dwellings on Loughton were interviewed as it was quickly recognised that a larger sample from Loughton would not be cost effective. However, had those Loughton residents interviewed reported a great degree of disturbance it would have been appropriate to extend the sample in Loughton.

ii) The Interview

Alternatives to the 'face-to-face' interview were explored, evaluated and costed, eg.,

a) using a self-completion questionnaire with follow up interview for the residential feedback.

b) using diaries to record disturbance and household movement.

MKDC & BMRB agreed that the 'face-to-face' interview remained the preferred approach as a good response rate and complete/accurate data was of prime importance.

iii) Respondent Selection

* BMRB argued that the respondent could be any one responsible adult or that it would be preferable to interview housewives.

* The above options would not necessarily provide a representative sample of male and female respondents. To overcome this, it was decided that addresses be divided equally between 'male' and 'female' addresses. Interviewers were required to interview a male or female adult depending on the 'label' attached to that address. In the case of single person households the adult present was interviewed, irrespective of their 'match' with the male/female 'label' for that address (see Section 4.1).

iv) Questionnaire Design

* MKDC believed it was important to lead in with several open ended general questions to elicit information, unpredjudiced by previous mention of the WDG.

* BMRB pointed out the need for experienced interviewers to administer this type of questionnaire and MKDC accepted that this would need to be reflected in the overall cost of the project.

* BMRB/MKDC liaised over detailed wording of questionnaire with no fundamental changes found to be necessary. The final version of the questionnaire is set out in Appendix III. The layout of the questionnaire was that most convenient for BMRB's interviewers.

3.4 DRIVER ROADSIDE STUDY

i) Interviewing Stations

* The technicalities of finding a suitable safe site for interviewing Northbound traffic proved the most difficult. The distance between the WDG and the next roundabout in that direction was limited and therefore

the interview station was in close proximity to the WDG and a distraction to Southbound traffic. In order to ascertain whether the interview station itself distracted drivers attention or affected observations of the WDG, it was necessary to interview the Southbound traffic when the Northbound interview station was not set up. This was done for one of the survey periods. Results indicated that the Northbound station did not distract drivers attention or detract from their view of the WDG.

ii) Operation of the WDG

* MKDC's brief specified that the WDG needed to be in operation during the fielwork periods. In practice the logistics of organising this were impossible to achieve.

* During all of the interviewing times the WDG was only operational for part of the time and it was not possible to look at differences in distraction/opinions under operational and non-operational conditions respectively.

* To overcome this problem, the questionnaire was designed to collect opinions of the WDG based on drivers' past experience and not just on that specific journey. It was known that the majority of drivers used the V4 Watling Street regularly.

iii) Police Liaison

* Logistics and project management for this part of the project were complex and MKDC took on the full liaison role between BMRB's interviewers and the Police.

* MKDC also carried out the manual traffic enumeration/ classification exercise undertaken in conjunction with the survey.

3.5 PILOT STUDIES

All three components of the research included small pilot studies.

Following Residential and Driver Feedback pilots, minor modifications to questionnaire design and procedures were made, but the basic approach to fieldwork was not altered.

The pilot work for the Observational Study was crucial in shaping the final method. This reflected the innovative nature of the work.

The next Section (Section 4) describes in more detail what happened in the pilot and the main stages of fieldwork.

SECTION 4 - THE FIELDWORK

4.1 RESIDENT FEEDBACK (As Reported by BMRB)

A pilot exercise was carried out on the evening of 1st June 1987 and the afternoon of 2nd June 1987. The Milton Keynes Development Corporation made appointments with residents at 5 addresses over both dates. The addresses selected were taken from different sites and represented a mixture of shared ownership and sale houses. They also differed in terms of their proximity to the aerogenerator.

Mainstage fieldwork was conducted between 22nd June 1987 and 3rd July 1987. At the time fieldwork commenced 145 addresses (excluding those used at the pilot stage) on the estate were believed to be occupied. These addresses were therefore issued to the interviewers, along with the addresses of an additional 5 houses in Loughton which are amongst those closest to the aerogenerator.

Since the questionnaire covers the decision process involved in the household's recent move it was decided that only heads of household and housewives should be interviewed. Addresses were pre-selected as either 'male' or 'female' and in this way interviewers were given a quota of interviewing heads of households versus housewives in joint households. If the relevant respondent was not in, an appointment was made for recall. Interviewers were asked to make at least 4 attempts to obtain an interview at each address, and in many cases they made many more. As a result of this 108 (including 5 on Loughton) effective interviews were achieved (a response rate of 75%).

Some corrective weighting was carried out in analysis, to ensure a representative sample profile in terms of site. Interviews on sites C and G were therefore targetted to equal 23% of the whole and remaining interviews were targeted to 77% of the whole. Possible versus achieved interviews on each site are shown in the table below.

Possible v. Achieved Interviews : Energy Park Residential

Site	Possibles		Achieved	
	145	%	108	%
C	25	17	14	13
G	8	6	3	3
E	21	14	16	15
1 & 1A	42	29	34	31
Loughton	5	3	5	5
2	17	12	15	14
4	21	14	17	16
F	3	2	2	2
J1	3	2	2	2

(NB: The different 'sites' are separate housing schemes).

Appendix III contans the questionnaire used and interviewer instructions.

4.2 DRIVER FEEDBACK (As Reported by BMRB)

Two interview sites were set up on the road side - one for interviewing Northbound traffic and one for Southbound. In the Southbound direction a convenient layby meant that traffic could quite easily be pulled off the road, and the driver interviewed. In the Northbound direction the problem was slightly more complex as an interview bay had to be set up on the road itself, while still allowing traffic to pass in both directions. The layout of each site is shown at the end of this section.

Police help was enlisted (as required by law) to conduct the roadside stage of the research and two interviewers and one supervisor worked on each site conducting interviews simultaneously. At the supervisor's request, the policeman stepped out into the road and stopped the flow of traffic and directed the first three vehicles into the interview bay. There were some vehicles the police were asked not to stop. (See instruction sheets in Appendix 3).

Once three vehicles were in the interview bay, interviews were conducted simultaneously by the one supervisor and two interviewers working on each site. Once all three interviews had been concluded the supervisor would indicate to the policeman that this was the case. He then stepped out into the road again and stopped the traffic. Only then were the three vehicles in the interview bay allowed to leave. Three new vehicles were then directed in and the process re-started.

A pilot was conducted on 7th July 1987 between 5pm and 7pm, on the Northbound site only. The site was chosen because it was slightly more awkward in terms of layout. Because of the unusual, and potentially dangerous nature of the interviewing, the interviewers were fully briefed beforehand.

The result of the pilot was that more interviews were achieved than anticipated, the system adopted for directing traffic into the interview bay was found to work well, and only a few very minor changes were made to the layout of the site.

The mainstage was intended to incorporate three dates. The times of interviewing differed from day to day to represent different levels of traffic flow. The three dates covered for the mainstage of the survey were as follows:

Tuesday, 14th July 1987 - 3pm-7pm
Thursday, 16th July 1987 - 7am-11am
Saturday, 18th July 1987 - 9am-1pm

It was felt that the road signs and cones set up in each direction might themselves consitute a distraction to the extent that the drivers might not notice the aerogenerator although they might have previously. In order to investigate whether such a factor did exist, on the first of the dates given above - 14th July 1987 - the Milton Keynes Development Corporation asked us to

interview on the Southbound site only, so that the results for this date could be compared with the results for the following two dates at the analysis stage.

For the same time periods during which interviewing was being conducted, the Milton Keynes Development Corporation simultaneously carried out a traffic count by type of vehicle per quarter hour time segment in each direction.

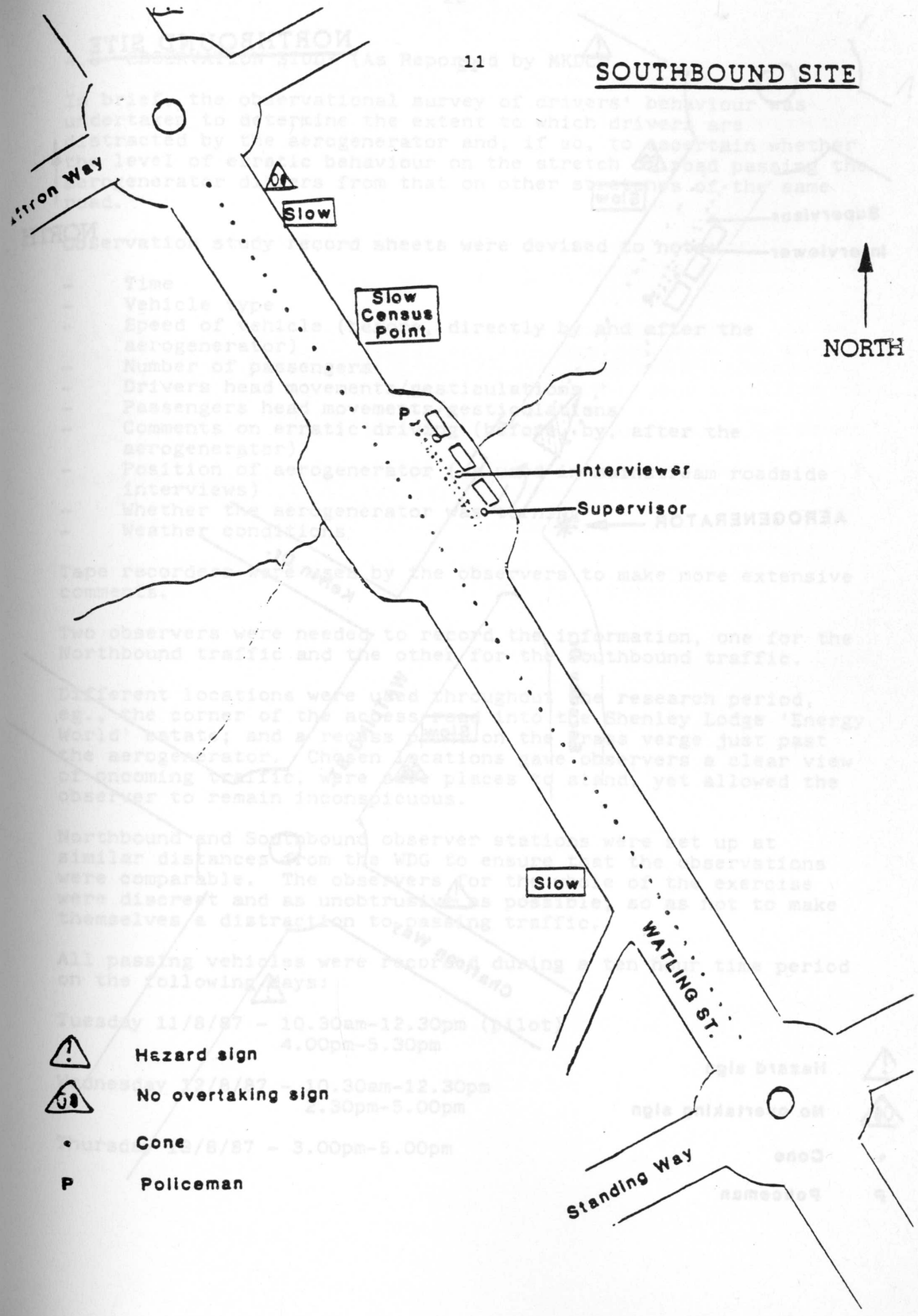
By comparing with the type of vehicles interviewed during the same time periods it emerged that we had interviewed types of vehicles in almost exactly the same proportions. It was therefore not necessary to weight the data at analysis stage by type of vehicle.

However, because of interviewer breaks, at certain times there were only 2 interviewers working on each site instead of three. Data were therefore weighted by hour within day. The following table shows achieved interviews against actual traffic count data.

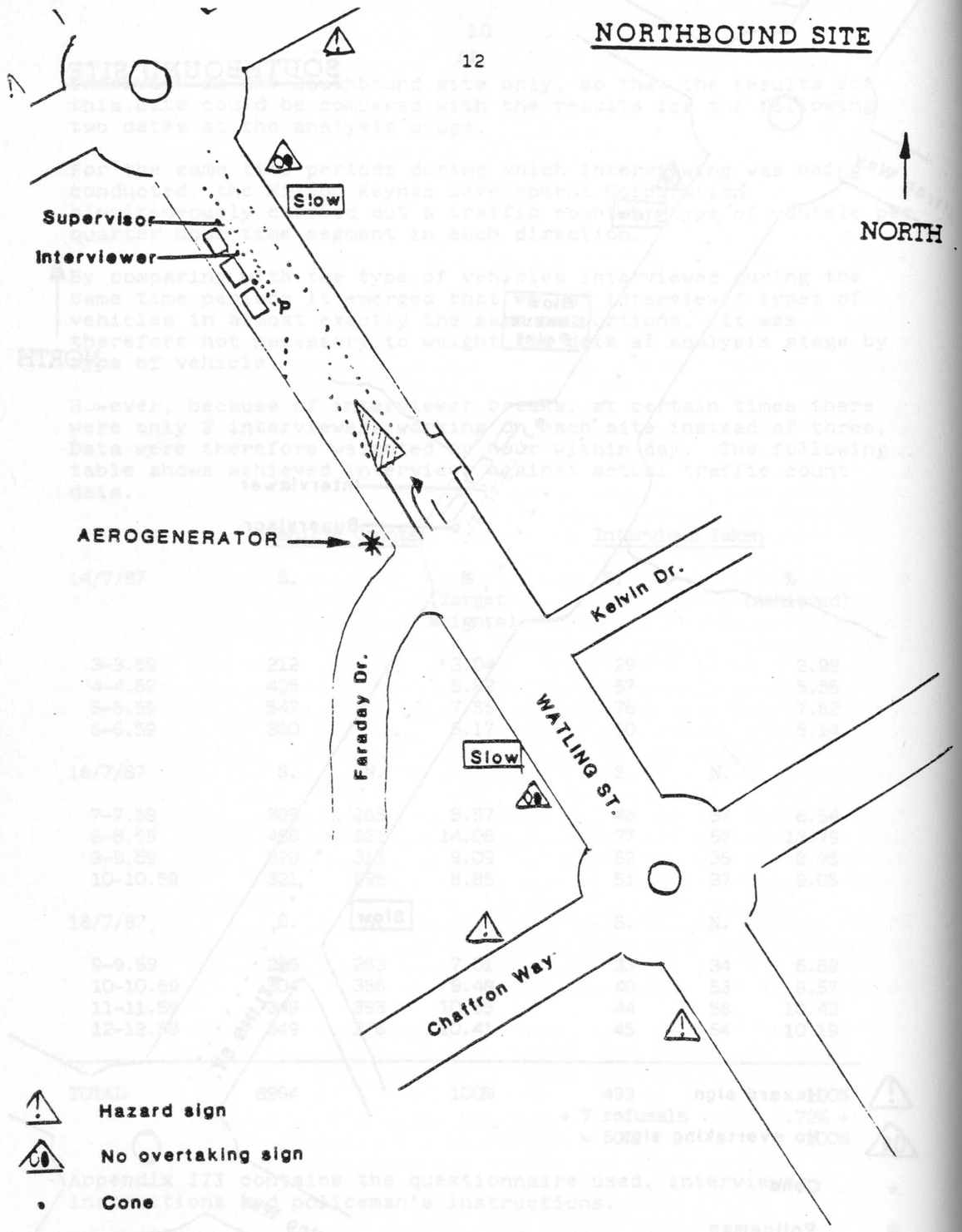
	Vehicle Counts			Interviews Taken		
14/7/87	S.		% (Target Weights)	S.		% (Achieved)
3-3.59	212		3.04	29		2.98
4-4.59	405		5.82	57		5.86
5-5.59	547		7.85	76		7.82
6-6.59	360		5.17	50		5.14
16/7/87	S.	N.		S.	N.	
7-7.59	309	288	8.57	46	37	8.54
8-8.59	458	521	14.06	77	57	13.79
9-9.59	320	313	9.09	52	35	8.95
10-10.59	321	295	8.85	51	37	9.05
18/7/87	S.	N.		S.	N.	
9-9.59	225	263	7.01	33	34	6.89
10-10.59	304	356	9.48	40	53	9.57
11-11.59	349	393	10.65	44	58	10.49
12-12.59	349	376	10.41	45	54	10.19
TOTAL	6964		100%	493 + 7 refusals = 500		100% .72% + = 100%

Appendix III contains the questionnaire used, interviewer instructions and policeman's instructions.

SOUTHBOUND SITE



NORTHBOUND SITE



Hazard sign

No overtaking sign

Cone

P Policeman

4.3 OBSERVATION STUDY (As Reported by MKDC)

In brief, the observational survey of drivers' behaviour was undertaken to determine the extent to which drivers are distracted by the aerogenerator and, if so, to ascertain whether the level of erratic behaviour on the stretch of road passing the aerogenerator differs from that on other stretches of the same road.

Observation study record sheets were devised to note:

- Time
- Vehicle type
- Speed of vehicle (before, directly by and after the aerogenerator)
- Number of passengers
- Drivers head movements/gesticulations
- Passengers head movements/gesticulations
- Comments on erratic driving (before, by, after the aerogenerator)
- Position of aerogenerator (as used in mainstream roadside interviews)
- Whether the aerogenerator was turning
- Weather conditions

Tape recorders were used by the observers to make more extensive comments.

Two observers were needed to record the information, one for the Northbound traffic and the other for the Southbound traffic.

Different locations were used throughout the research period, eg., the corner of the access road into the Shenley Lodge 'Energy World' estate; and a recess point on the grass verge just past the aerogenerator. Chosen locations gave observers a clear view of oncoming traffic, were safe places to stand, yet allowed the observer to remain inconspicuous.

Northbound and Southbound observer stations were set up at similar distances from the WDG to ensure that the observations were comparable. The observers for the whole of the exercise were discreet and as unobtrusive as possible, so as not to make themselves a distraction to passing traffic.

All passing vehicles were recorded during a ten hour time period on the following days:

Tuesday 11/8/87 - 10.30am-12.30pm (pilot)
4.00pm-5.30pm

Wednesday 12/8/87 - 10.30am-12.30pm
2.30pm-5.00pm

Thursday 13/8/87 - 3.00pm-5.00pm

Following the initial observational session (ie., the pilot study), it was found that the original record sheet was too cumbersome. It was decided to break down the record sheet to its essential components:

- Time
- Vehicle type
- Speed
- Passengers (adult/child)
- Noticing aerogenerator
- Comments

The use of the tape recorder was vitally important as an aid to making the necessary comments (especially when the traffic flows increased). The observer indicated when a taped comment was made by putting a code number in the 'Comments' section of the record sheet, and by saying this code number at the beginning of each taped note, thus making the final analysis easier to carry out.

For the main study it was decided that only those vehicles which showed a noticeable awareness of the aerogenerator should be noted.

SECTION 5 - ANALYSIS OF FINDINGS

5.1 DATA PREPARATION

BMRB were responsible for the following:

* Data coding and entry.
* Data validation (including MKDC's input).
* Production of tables, to MKDC's specification.

5.2 ANALYSIS

MKDC undertook analysis of data and production of the final report of findings.

In the analysis, MKDC was able to:

* identify the 'main messages' and make judgements to eliminate findings which showed no significant patterns.
* ensure that the key issues were properly addressed and that the information provided was sufficient on which to base judgements (by others) of the future location of the WDG (stay where it is, remove altogether, relocate).

SECTION 6 - EVALUATION OF METHODOLOGY AND LESSONS LEARNT

6.1 SCOPE OF PROJECT

The basic approach to the research proved to be a sound one, worthy of replication elsewhere.

The remainder of this section evaluates specific aspects of the three component surveys. It also makes recommendations which would help to refine future surveys of this kind.

6.2 COMBINING DIFFERENT SURVEYS

An agency with experience both of residential and roadside interviewing would have been ideal. No single agency with equal skills in both of these was identified. It was apparent that there remained an essential project management role for the Survey Research Team once the agency was appointed.

6.3 ENSURING QUALITY

The project emphasised the importance of selecting an experienced and well resourced agency for the fieldwork. The quality of briefing and design of the resident and driver questionnaires was crucial and the pilot surveys were key in ensuring that quality.

6.4 RESIDENT FEEDBACK SURVEY

6.4.1 Individual Perceptions

The brief required that one adult from each household be interviewed to obtain resident feedback. Perceptions of noise disturbance and visual intrusion proved to be very personal individually variable. Interviewees found it difficult to represent the views of other members of their household.

It is recommended that future projects of a similar nature should concentrate on the views of individuals

A high proportion of interview time needs to be given over to discussing individual perceptions of noise. Open-ended questions proved essential in obtaining unsolicited views on potential WDG disturbance. Prompted questions alone would not have provided a true picture.

6.4.2 Evaluation of Questionnaire

As noted above, the mix of open and closed end questions is the correct approach. Detailed comments on specific questions follow:

* The survey was introduced in a general fashion asking people about their general experiences living in Shenley Lodge (the Energy Park). This approach worked well and set attitudes to the WDG in the context of overall satisfaction with the neighbourhood.

* Q15-Q26 inclusive were about information given to occupiers by the selling agents. These were asked of residents of 3 sites only. As recalled information was very minimal, one open-ended question would be sufficient.

* Q36 used various onomatopoeiac words to describe the noise of the WDG. This question was enjoyed by residents and helped to maintain their interest. The question was experimental and was very important in explaining residents' perception of noise - particularly how an intrusive noise was interpretted.

6.4.3 Effect of Distance

It was always appreciated that noise and visual disturbance from the WDG would diminish with distance from the structure. The significance of this effect, though was under-estimated.

It is recommended that in future surveys of this kind great care is taken to reflect this in sample selection. Over-sampling of addresses nearer the WDG may be appropriate. For this project, all occupied dwellings were surveyed, thus over-sampling was not an issue.

6.4.4 Sampling Methods

Using pre-determined 'male' and 'female' addresses ensured a representative sample of adults in the area. This sampling technique is recommended where resources do not permit a census of all adults.

6.5 DRIVER FEEDBACK STUDY

6.5.1 Project Management

Close project management and, in particular, good liaison with the police was very important in ensuring that this component of the project ran efficiently. Adequate executive time needs to be made available for this.

6.5.2 Fieldwork

Two minutes (or thereabouts) is the optimum time for roadside interviews. It is imperative that the interview stations are properly set up, that they are completely safe yet as unobtrusive as possible.

6.5.3 Questionnaire Design

The final questionnaire worked well and efficiently.

Q6 (using photographs showing different views of the WDG), did not provide conclusive results. The question was useful in identifying those who had no recollection of the WDG's position. Other drivers had great difficulty in

picking out the photograph which matched their view of the WDG. This may be explained by changes in the visual appearance and apparent direction of the WDG as drivers got nearer to it.

6.6 OBSERVATION STUDY

The driver observation component of the project was experimental with experience from very few other studies to draw on.

It proved extremely difficult to identify accurate measurement techniques and to provide a consistent approach. Observer interpretation of driver behaviour could lessen the accuracy of results. To overcome this, a very systematic process for recording results is needed as well as a large number of observations (to minimise the influence of single abherent records). It may also be useful to use a variety of observers (thus minimising the impact of 'bias' from any one observer).

Further development work is needed to devise a more scientific approach, eg., by use of video cameras.

APPENDIX I

1. BRIEF PREPARED BY MKDC FOR MARKET RESEARCH AGENCY TENDERING FOR FIELDWORK/DATA PREPARATION CONTRACT

INTRODUCTION

An area of Milton Keynes is designated for the development of an Energy Park containing housing and industry designed to demonstrate the use of innovative techniques in energy saving and efficiency. The initial stage of the Park has been completed, culminating in an exhibition last Autumn.

One of the housing schemes involves supplying a number of private dwellings with electricity generated from solar and wind power, using photovoltaic technology and a 21½ metre high aerogenerator.

OBJECTIVES

The siting of the aerogenerator is on the boundary of the housing development site, adjacent to a major city highway and an access road into the Energy Park. Research is needed into the suitability of this site from a visual and noise intrusion point of view of nearby residents and road users.

Temporary planning permission enabled the aerogenerator to be installed some months ago, and it will soon be operational. The private dwellings completed in this first stage are starting to be occupied.

Tenders are invited from three Market Research Agencies to carry out research into the physical and aesthetic issues arising from the use of an aerogenerator in a built up area to provide electricity.

METHODOLOGY

It is proposed to carry out various approaches to obtain feedback on the aerogenerator. The following parts of the research programme will require the services of a Market Research Agency(s):

1) attitudinal research of residents of the Energy Park and adjacent grid squares;

2) attitudinal research of road users passing the aerogenerator;

After discussions, an initial framework for the research is set out as follows. However, this is by no means rigid and any advice and proposals for a more cost effective methodology would be considered. The attached comprises a detailed brief for each piece of research.

2. DETAILED BRIEF 1

RESIDENT INTERVIEWS

Method

It is proposed to carry out face-to-face interviews in the homes of a sample of residents in the Energy Park. For each address in the sample an individual will need to be selected for interview.

Sample

A sample of 168 addresses will be supplied by MKDC executives, based on dwelling size and occupancy length. Initially addresses will be sampled in the following manner : All dwellings on the site nearest to the aerogenerator and 1 in 2 of all dwellings in the surrounding sites, 27 addresses will be issued from the adjacent grid square to the Energy Park.

Interview Time Period

After around 5 pilot interviews have been conducted in close consultation with MKDC executives, the main stage of interviews should be conducted in the daytime and evenings. Interviewers would be expected to make appointments and to make at least 4 call backs to make contact. Response rate of least 75% is expected and previous research conducted with this type of household would indicate that it is more likely to be higher.

Questionnaire

The interviews are expected to last ½ to ¾ hour and will be of a semi-structured nature. The questionnaire will mainly consist of half open-ended questions requiring probing techniques, the other half of closed-ended questions and therefore will need to be undertaken by experienced interviewers.

A draft is attached to give an impression of the scope of the research. We should emphasise that this is at a very early stage. Briefly, the topics covered are demographic details, expectations pre and post moving, pattern of use of dwelling, opinions and attitudes to energy efficiency and related topics, perceptions of the aerogenerator from an aesthetic, noise and safety point of view.

Results

Coding of data collected will be required and coding frames for open-ended questions compiled with the agreement of MKDC executives. Data input and computer analysis will be required producing an end product of a full set of cross-tabulations as agreed with MKDC executives. If posible it would be useful to have a verbal debriefing by interviewers on their impressions gained from doing the survey.

Timetable

The timing of this piece of research is limited by the need for results to be made available to us by no later than the 1st June 1987. Owing to the rate at which the houses on the Energy Park are being occupied, a sensible start time for the main stage of interviewing to begin will be at the beginning of April.

3. DETAILED BRIEF 2

ATTITUDINAL RESEARCH ON THE AEROGENERATOR FROM USERS OF THE ADJACENT ROAD

Method

Roadside interviews are the best method for collecting information from road users. Two interview stations are preferable, situated on the V4 Watling Street (this is the original A5), one to sample northbound traffic, the other south. The siting of these stations, after a preliminary site visit is certainly possible. Both stations need to be some distance past the aerogenerator in either direction. To the South a layby is available with the capacity for at least 3 car lengths. To the North, an interview station would have to be on the highway but the road width will allow passing traffic to flow.

Sample

A sample of car, motorcycles/mopeds, vans, and lorry drivers is needed. Cyclists and pedestrians are not included. Other special road users will also need to be considered for exclusion.

With most one direction traffic flows exceeding 300 vehicles per hour during the day and estimating a 3-car interview station an achieved sample of 850 vehicles needs to be interviewed. This is 10% of the total flow. Working on an 85% response rate, 1000 vehicles need to be selected for interview. Details of traffic flows are available if needed.

Survey Period

To achieve the required sample it is proposed to interview on two separate week days; a time period of 7am to 11am on one day and of 3pm to 7pm on the other. In addition, a Saturday will be covered from 9am to 1pm. Contingency plans need to be made for adverse weather conditions, ie., the three survey days need to be when the aerogenerator can be seen clearly and is in operation - it is not when there is no wind or a gale blowing.

Questionnaire

Interviews will consist of a few closed questions only taking up to a maximum of two minutes. An outline of the questions needed is attached. A pilot survey is necessary in close consultation with MKDC executives.

Results

Coding and computerisation will be required, and analyses resulting in a full report of cross-tabulations as agreed with MKDC executives.

Timetable

Results are needed no later than the 1st June 1987. Therefore the survey needs to take place sometime during early April.

Consultation

Obviously to carry out this type of survey requires the permission of the Police Force.

Consultations with the local police will need the involvement of MK but, when permission is gained, the details and payment of any costs incurred by Police involvement will be the responsibility of the Market Research Agency.

Suggested Questions for Roadside Interviews

Note - type of vehicle
- number of passengers - adults/children
- sex/age of drivers

Questions

- Where have you come from?
- What is your destination?
- What is the main purpose of your journey?
- How often do you use this particular stretch of road?
- Did you notice anything which you believe is a traffic hazard, in the last 2 minutes?
- Did you notice a windmill type structure?
- Do you consider it to be a distraction to drivers in general?
- What do you think of it's appearance?
- Did you notice which way it was pointing? (to check for accuracy of observation on that day)

4. DETAILED BRIEF 3

RESEARCH BY DRIVER OBSERVATION/ACCIDENT REPORTS
(NB: This component of the Survey was undertaken by MKDC).

This part of the overall aerogenerator research programme will be done using in-house resources. However, a detailed brief on the methods is as follows:

Methods

a) Statistics will be collected of any accidents on the road adjacent to the aerogenerator (V4 Watling Street). Comparisons will be made with statistics on any accidents prior to the installation of the aerogenerator. Further research on accidents statistics on other parts of the V4 in Milton Keynes should be considered.

b) An observational survey will be carried out of drivers behaviour to determine to what extent the drivers are distracted by the aerogenerator. An observer will be sited near the aerogenerator but on the other side of the road and as unobtrusive as possible. They will be required to note drivers head movements as an indication of direction as the driver approaches the site of the aerogenerator. All passing vehicles will be noted during a specific time period of 4 hours (2 hours either direction) on 2 weekdays and one Saturday. The days should not be the same as that of the roadside interviews. Aprroximately 4000 observations should be achieved, 15% of all traffic flows on the V4 over the period of a week.

c) Observations to accertain whether the level of erratic behaviour on the stretch of road passing the aerogenerator differs from that of other stretches of the same road. Analysis of the types of erratic behaviour will attempt to find any link with the aerogenerator causing a distraction.

An observer will be required to note any erratic behaviour observed, according to categories devised by piloting. An extensive time period should be used for this survey, from 7am-11am and 3pm-4pm on two weekdays and from 9am-11pm on a Saturday. Both directions can be observed. A tape recorder would be of use in noting observations. At the same time and day a second observer should carry out the same observations on a comparative stretch of road.

Results

For both part b) and c) in-house resources will be used for coding and computing, SNAP will probably be able to cope with the data. Analyses will provide a full report of findings.

Timetable

Results need to be completed by the 1st June 1987 and therefore this piece of the research should be carried out at the end of April/beginning of May.

MKDC's DRAFT QUESTIONNAIRE

3rd DRAFT - RESIDENT INTERVIEWS — SELECT HOUSEHOLDER/HOUSEWIFE

1a) On what date did you move to this house?

Date Month

1b) Where did you move from? .....

2) What was your main reason for moving when you did?

FINANCIAL CONSIDERATIONS
CHANGE IN JOB CIRCUMSTANCES
OPPORTUNITY TO GET A HOUSE
WANTED TO LIVE ON THE ENERGY PARK
OTHER (**please specify**)

.....

3) Why did you choose this particular house?

ONLY ONE AVAILABLE
AFFORDABILITY
LIKED DESIGN
LIKED LOCATION
LIKED ENERGY SAVING FEATURES
OTHER (**please specify**)

.....

.....

HOUSEHOLDS DETAILS

4a) I would like to find out about all the people who normally live at this address. How many persons is that? .....

(b) Person No.	(c) Relationship to Respondent	(d) Sex	(e) Age	(f) Economic Status	(g) Hours At Home
01					
02					
03					
04					
05					

g) Approximately how many hours does each person spend in the home? **(code in column g)**

h) Is anyone a shift worker (ie., working at night)? YES NO

5a) Do you know of the aerogenerator (windmill type construction) on the Energy Park?

YES

NO

DON'T KNOW

b) Can you tell me what it is designed to do?

(listen to explanation and code)

GENERATES ELECTRICITY...

..FROM WIND

..FROM SOLAR POWER

NO, DON'T KNOW

NOT SURE

6a) Was the aerogenerator working when you visited the estate and decided to buy?

YES

NO

DON'T KNOW

b) When the aerogenerator is operational, is the noise level as you expected or worse/better than before you moved in? **(Show Card)**

MUCH WORSE

SLIGHTLY WORSE

AS EXPECTED

SLIGHTLY BETTER

MUCH BETTER

DON'T KNOW

7a) Does the aerogenerator's noise disturb you or your household in any way?

YES

NO

If yes, in what way? **(Write in)** .....

.....

b) IF NOISE REASONS ARE GIVEN, at what times of the day does this noise disturbe you:

ALL THE TIME

NIGHT ONLY

DAY ONLY

OTHER

c) Are there any particular circumstances when you find the areogenerator noisy?

INSIDE HOUSE - WINDOWS OPEN

INSIDE HOUSE - WINDOWS CLOSED

OUTSIDE IN GARDEN

GOING PAST SITE

OTHER, specify

Look at this sheet (a = noise, b = visual, c = safety) and tick the box that most closely matches your views:

	STRONGLY AGREE	AGREE	INDIFFERENT	DISAGREE	STRONGLY DISAGREE
8a) The noise from the aerogenerator is disturbing					
b) I consider the aerogenerator to be safe					
c) The aerogenerator looks ugly					

9) Have any other members of your household expressed an opinion on the aerogenerator?

YES

NO

If YES, in what respect?

CONCERNS ABOUT SAFETY

CONCERNS ABOUT NOISE

VISUAL CONCERNS

FAVOURABLE COMMENTS

TECHNICAL ASPECTS

OTHER UNFAVOURABLE COMMENTS

10a) What do you think of the site chosen for the aerogenerator? Is it:

VERY SATISFACTORY

SATISFACTORY

INDIFFERENT

UNSATISFACTORY

VERY UNSATISFACTORY

b) If UNSATISFACTORY or VERY UNSATISFACTORY, where do you think is the best place for the aerogenerator to be situated? **(show map - code reference)**

c) Why, in your opinion is this a better place? **(open ended)**

.....

.....

.....

.....

11) In general, do you agree or disagree that the benefit of having energy provided by aerogenerators outweighs the disadvantages?

STRONGLY AGREE
AGREE
DISAGREE
STRONGLY DISAGREE
DON'T KNOW

12a) Does the aerogenerator supply any electricity to your house?

YES — Go to Q12b
NO — Go to Q12d
DON'T KNOW

b) If YES, how much money do you expect to save in a year?

.....

c) If the aerogenerator did not supply you with energy, would you object to it in its current location?

YES
NO
DON'T KNOW

d) If NO/DON'T KNOW to Q.12a), would your opinions of the aerogenerator remain the same or be more favourable, if you directly benefitted by getting cheap electricity?

STAY THE SAME
MORE FAVOURABLE
DON'T KNOW

13) When choosing your house, did the aerogenerator and its location have any influence in your choice?

YES
NO

If YES, in what way? **(open ended)**

.....

.....

.....

.....

14a) Do you think the aerogenerator increases or decreases your house value?

INCREASE
DECREASE
NO DIFFERENCE
DON'T KNOW

If INCREASE or DECREASE, by what amount do you think the value is increased/decreased?

b) Do you think the aerogenerator increases or decreases other house values on the Energy Park?

INCREASE
DECREASE
NO DIFFERENCE
DON'T KNOW
VARIABLE

If INCREASE or DECREASE, by what amount do you think?

15) Do you think the aerogenerator will make it harder or easier to sell your house in the future?

HARDER
EASIER
NO DIFFERENCE
DON'T KNOW

If HARDER or EASIER, why do you say that?

16) Have you found that the aerogenerator has contributed to the cost of your house insurance?

YES
NO
DON'T KNOW

17) **FOR HOUSES NOT DIRECTLY ADJACENT TO THE AEROGENERATOR SITE**
Would your opinion improve, get worse or stay the same if the aerogenerator was sited at the bottom of your garden?

IMPROVE
GET WORSE
STAY THE SAME
DON'T KNOW

18) Do you think the aerogenerator constitutes a distraction to drivers passing it?

YES
NO
DON'T KNOW

19) In your opinion, considering all the advantages and disadvantages, do you think it is necessary to move the aerogenerator to a different site?

YES
NO
DON'T KNOW

20) Could anything be done to improve the present aerogenerator site from a noise, visual and safety point of view?
(open ended)

.....

.....

PD/GR/JR/gr2
24.3.87

MKDC's DRAFT QUESTIONNAIRE

3rd DRAFT - RESIDENT INTERVIEWS — SELECT HOUSEHOLDER/HOUSEWIFE

1a) On what date did you move to this house?

Date Month

1b) Where did you move from? .....

2) What was your main reason for moving when you did?

FINANCIAL CONSIDERATIONS
CHANGE IN JOB CIRCUMSTANCES
OPPORTUNITY TO GET A HOUSE
WANTED TO LIVE ON THE ENERGY PARK
OTHER (**please specify**)

.....

3) Why did you choose this particular house?

ONLY ONE AVAILABLE
AFFORDABILITY
LIKED DESIGN
LIKED LOCATION
LIKED ENERGY SAVING FEATURES
OTHER (**please specify**)

.....

HOUSEHOLDS DETAILS

4a) I would like to find out about all the people who normally live at this address. How many persons is that? .....

(b) Person No.	(c) Relationship to Respondent	(d) Sex	(e) Age	(f) Economic Status	(g) Hours At Home
01					
02					
03					
04					
05					

g) Approximately how many hours does each person spend in the home? **(code in column g)**

h) Is anyone a shift worker (ie., working at night)? YES / NO

5a) Do you know of the aerogenerator (windmill type construction) on the Energy Park? YES / NO / DON'T KNOW

b) Can you tell me what it is designed to do? **(listen to explanation and code)**
GENERATES ELECTRICITY...
..FROM WIND
..FROM SOLAR POWER
NO, DON'T KNOW
NOT SURE

6a) Was the aerogenerator working when you visited the estate and decided to buy? YES / NO / DON'T KNOW

b) When the aerogenerator is operational, is the noise level as you expected or worse/better than before you moved in? **(Show Card)**
MUCH WORSE
SLIGHTLY WORSE
AS EXPECTED
SLIGHTLY BETTER
MUCH BETTER
DON'T KNOW

7a) Does the aerogenerator's noise disturb you or your household in any way? YES / NO

If yes, in what way? **(Write in)** .....

.....

b) IF NOISE REASONS ARE GIVEN, at what times of the day does this noise disturbe you:
ALL THE TIME
NIGHT ONLY
DAY ONLY
OTHER

c) Are there any particular circumstances when you find the areogenerator noisy?
INSIDE HOUSE - WINDOWS OPEN
INSIDE HOUSE - WINDOWS CLOSED
OUTSIDE IN GARDEN
GOING PAST SITE
OTHER, specify

Look at this sheet (a = noise, b = visual, c = safety) and tick the box that most closely matches your views:

		STRONGLY AGREE	AGREE	INDIFFERENT	DISAGREE	STRONGLY DISAGREE
8a)	The noise from the aerogenerator is disturbing					
b)	I consider the aerogenerator to be safe					
c)	The aerogenerator looks ugly					

9) Have any other members of your household expressed an opinion on the aerogenerator? YES / NO

If YES, in what respect?

CONCERNS ABOUT SAFETY
CONCERNS ABOUT NOISE
VISUAL CONCERNS
FAVOURABLE COMMENTS
TECHNICAL ASPECTS
OTHER UNFAVOURABLE COMMENTS

10a) What do you think of the site chosen for the aerogenerator? Is it:

VERY SATISFACTORY
SATISFACTORY
INDIFFERENT
UNSATISFACTORY
VERY UNSATISFACTORY

b) If UNSATISFACTORY or VERY UNSATISFACTORY, where do you think is the best place for the aerogenerator to be situated? **(show map - code reference)**

c) Why, in your opinion is this a better place? **(open ended)**

.....
.....
.....
.....

11) In general, do you agree or disagree that the benefit of having energy provided by aerogenerators outweighs the disadvantages?

STRONGLY AGREE
AGREE
DISAGREE
STRONGLY DISAGREE
DON'T KNOW

12a) Does the aerogenerator supply any electricity to your house? YES — Go to Q12b / NO — Go to Q12d / DON'T KNOW

b) If YES, how much money do you expect to save in a year? .....

c) If the aerogenerator did not supply you with energy, would you object to it in its current location?

YES
NO
DON'T KNOW

d) If NO/DON'T KNOW to Q.12a), would your opinions of the aerogenerator remain the same or be more favourable, if you directly benefitted by getting cheap electricity?

STAY THE SAME
MORE FAVOURABLE
DON'T KNOW

13) When choosing your house, did the aerogenerator and its location have any influence in your choice? YES / NO

If YES, in what way? **(open ended)**

.....
.....
.....
.....

14a) Do you think the aerogenerator increases or decreases your house value?

INCREASE
DECREASE
NO DIFFERENCE
DON'T KNOW

If INCREASE or DECREASE, by what amount do you think the value is increased/decreased?

b) Do you think the aerogenerator increases or decreases other house values on the Energy Park?

INCREASE
DECREASE
NO DIFFERENCE
DON'T KNOW
VARIABLE

If INCREASE or DECREASE, by what amount do you think?

15) Do you think the aerogenerator will make it harder or easier to sell your house in the future?

HARDER
EASIER
NO DIFFERENCE
DON'T KNOW

If HARDER or EASIER, why do you say that?

16) Have you found that the aerogenerator has contributed to the cost of your house insurance?

YES
NO
DON'T KNOW

17) **FOR HOUSES NOT DIRECTLY ADJACENT TO THE AEROGENERATOR SITE**
Would your opinion improve, get worse or stay the same if the aerogenerator was sited at the bottom of your garden?

IMPROVE
GET WORSE
STAY THE SAME
DON'T KNOW

18) Do you think the aerogenerator constitutes a distraction to drivers passing it?

YES
NO
DON'T KNOW

19) In your opinion, considering all the advantages and disadvantages, do you think it is necessary to move the aerogenerator to a different site?

YES
NO
DON'T KNOW

20) Could anything be done to improve the present aerogenerator site from a noise, visual and safety point of view?
(open ended)

.....

.....

PD/GR/JR/gr2
24.3.87

APPENDIX II

EXTRACTS FROM BMRB's PROPOSAL

1. ATTITUDINAL RESEARCH AMONGST RESIDENTS

The methodology you propose seems both appropriate and practical. The only issue which perhaps needs some debate is who precisely we should seek to interview. Since the questionnaire covers the decision process involved in the household's recent move we obviously want to speak to Heads of Households and/or Housewives rather than simply any responsible adult (which would include teenage children or elderly relatives). However one might argue that we could confine our sample to the housewife (who would be male in all male households) on the grounds that she would be able to give us all the information required and, in the case of non- or part-time-working housewives, would be more exposed to the aerogenerator and may thus have more to say about it if it is indeed causing problems for residents. This approach has the benefit of some marginal cost-saving since less evening work would be required of interviewers. I will provide costs for both options, but the difference is not great so it is probably best for you to debate which sample is most relevant to your needs. Obviously, if you go for the Head of Household/Housewife approach we would follow controls to ensure that representative numbers of each are interviewed.

As you point out, the questionnaire does contain a relatively high proportion of open-ended questions and experienced interviewers are needed to administer it In fact we rarely have a questionnaire that is fully pre-coded and all our interviewers are therefore well aware of the need for full and thoughtful probing. The average interviewer working for BMRB has been with us for 4 years and the average supervisor for 12 years so you can see that we can be certain of providing you with the level of quality required. We may need to call upon additional assistance from our sister company Mass Observation, but they are also subject to the same rigorous quality controls which we apply.

In summary, the details of the research amongst residents would be as follows:

Pilot Survey

- 5 pilot interviews would be conducted at addresses supplied by MKDC.
- Appointments would be made by BMRB executives if telephone numbers are available; otherwise an interviewer will call to make appointments.
- 2 separate half-days would be worked - 1 afternoon and 1 evening, in order to allow for changes to the questionnaire in the course of the pilot exercise.
- Pilot interviews would be conducted by a supervisor and half would be accompanied by a BMRB executive; the remainder could then be accompanied by an MKDC representative.

Main Stage

- 168 addresses will be supplied by MKDC sampling the surrounding area as specified in your brief.

- Interviews will either be with the Head of Household/ Housewife or with Housewives only.

- Interviewers will make appointments by phone or by personal call if telephone numbers are not available. If the appointment is not kept by the respondent, the interviewer will make at least 4 call backs at different times of day/days of week, preferably having rearranged the appointment. We agree that response rate should be at least 75%.

- For a Housewife sample a quarter of the fieldwork would be done in the evenings. For a Head of Household/Housewife sample, half the fieldwork would be in the evenings.

- Interviews will last between 30 and 45 minutes.

- Data preparation and cross tabulations are required, but no report. We will supply a technical record of the project.

- A verbal debrief of interviewers has been costed separately and I assume it could be held at MKDC offices (about 12-15 interviewers would be involved). A cheaper alternative would be to ask for written comments.

2. ATTITUDINAL SURVEY AMONGST ROAD USERS

Your estimates of the number of hours of road-side interviewing needed for this study are very close to mine, which is reassuring given the fact that we are both inevitably working somewhat in the dark at this point! Dealing just with one side of the road, assuming we have 3 interviewers working with the police stopping the traffic, and a 2-minute interview, I think that we should be able to achieve a rate of about 35 an hour. To get 425 interviews therefore we will need about 12 hours which is what your suggested shift pattern (1 weekday 7-11am, 1 weekday 3-7pm and 1 Saturday 9am-1pm) allows. If it is the case that 300 vehicles pass one-way in an hour then we should easily be able to stop 35. If anything, I would say that a higher rate might be possible and the pilot should establish whether or not this is the case. If so, I would suggest that we reduce the number of interviewers to 2 on each side of the road rather than cut the time periods during which interviewing will take place, as these are already fairly minimal. Obviously, there would be a cost-saving if we reduce the number of interviewers.

The pilot will, of course, be absolutely vital in ensuring that the main exercise runs smoothly both in terms of co-ordination with the police and the actual interviewing and sampling procedure. Until we have carried out the pilot we will not know precisely what we will be doing at the main stage so our cost for the main stage must be seen as dependent on the findings of the pilot.

The need to carry out the fieldwork on a clear day when the aerogenerator is in operation is somewhat problematical! However, April should be alright as it is not especially misty and tends to be quite breezy (though hopefully not too much so!) Postponing fieldwork at short notice obviously adds to administration costs. I think therefore that the best approach as far as costing is concerned is to give you a range and if all goes smoothly, the bottom end of the range will apply. Will you be able to get local weather reports and forecasts to help with such decisions? I have assumed that since the pilot will be mainly to test procedures, we will be able to carry it out on a fixed date.

To summarise:

Pilot

- 1 supervisor and 2 interviewers would work for c.2 hours at a peak weekday traffic period with a BMRB executive observing together with you or one of your colleagues.

- Their time would be divided between the 2 sides of the road.

Main Stage

- 2 stations would be in action, one on the north and one on the south side of the road as you describe.

- 1 supervisor and 2 interviewers would work at each side of the road for 12 hours in total, spread over the 3 shifts you suggest.

- Assuming a 2 minute interview we currently expect a rate of c.35 interviews per hour at each station, with a target of 850 interviews to be achieved in total.

- Data preparation and cross tabulation is required, and we would provide a technical record of the project.

APPENDIX III

FIELDWORK DOCUMENTATION

1. Resident Feedback Questionnaire
2. Interviewer Instructions and Show Cards
3. Driver Feedback Questionnaire
4. Interviewer/Supervisor Instructions
5. Policeman's Instructions

1. Residential Fieldwork Documents

JUNE 1987 JN : 1153-269

ENERGY PARK RESIDENTIAL

INTERVIEWERS INSTRUCTIONS - CONTACT QUESTIONNAIRE

You should interview only heads of household or housewives. The aim is to interview a person who was involved in the purchase of the home.

On your address list you will see that each address has been pre-selected as either a 'male' or 'female' house. You should transfer this information to the contact questionnaire.

1. If the HOUSEHOLDERS ARE A MAN/WOMAN COUPLE at a male address then you must interview the man. If he is not available you should ask if you can return later - you should not interview the woman in his place. Similarly, if it is a female address you may only interview the female partner.

2/3. If the HOUSEHOLDER IS A MAN WITHOUT A PARTNER OF THE OPPOSITE SEX or HOUSEHOLDER IS A WOMAN WITHOUT A PARTNER OF THE OPPOSITE SEX, you should interview him/her, regardless of whether it is a male or female address.

4. If the HOUSEHOLDERS ARE TWO OR MORE PEOPLE OF THE SAME SEX, and if they jointly own the property, then you may interview either of them, regardless of whether it is a male or female address. If only one of them owns the property then you should interview this person.

British Market Research Bureau, 53 The Mall, London W5 3TE

1987

ENERGY PARK RESIDENTIAL

CONTACT QUESTIONNAIRE

J.N. 1 1 5 3-2 6 9
1/2/3/4/5/6/7

HOUSEHOLD NO [| |] (8 9 10) CARD NO. [4] (11) AREA CODE [| |] (12 13 14)

Interviewer _____ INTERVIEWER CODE [| | |] (15 16 17 18)

Respondents Full Name (Mr/Mrs/Miss) _____

Respondents Full Postal Address _____

_____

_____

INTERVIEWER CODE FROM ADDRESS LIST: Male address 19. 1
Female address 2

INTERVIEW HEADS OF HOUSEHOLDS OR HOUSEWIVES ONLY

Good afternoon/evening. I am from the British Market Research Bureau and we are carrying out a survey for the Milton Keynes Development Corporation, to find out how residents feel about living in the Energy Park.

I would like to speak to...ASK AS APPROPRIATE ACCORDING TO INSTRUCTIONS

CODE HOUSEHOLD SITUATION:

1. HOUSEHOLDERS ARE A MAN/WOMAN COUPLE 20. 1
2. HOUSEHOLDER IS A MAN WITHOUT PARTNER 2
3. HOUSEHOLDER IS A WOMAN WITHOUT PARTNER 3
4. HOUSEHOLDERS ARE TWO OR MORE PEOPLE OF THE SAME SEX 4

CONTACT RECORD

Date	Time	Outcome

CODE FINAL OUTCOME

INTERVIEW WITH : Man 21. 1
Woman 2
Refusal 3
Non-contact 4
Other non-effective 5

22. —> 80.

British Market Research Bureau, 53 The Mall, London W5 3TE

1987

ENERGY PARK RESIDENTIAL

MAIN QUESTIONNAIRE

J.N. 1 1 5 3-2 6 9
1/2/3/4/5/6/7

Respondents Full Name (Mr/Mrs/Miss) _____

_____

Telephone No. (if any) : Exchange Name _____

Exchange No. _____ Tel no. _____

HOUSEHOLD NO: [| |] (8 9 10)

CARD NO.: [1] (11)

_____

Name _____ AREA CODE [| |] (12 13 14)

Interviewer _____ INTERVIEWER CODE [| | |] (15 16 17 18)

Interview time : From _____ To _____

Date of interview _____ 19____ INTERVIEW LENGTH (MINS) [|] (19 20)

Supervisor _____ OFFICE USE ONLY [ ] (21)

_____

(MAKE SURE YOU HAVE COMPLETED CONTACT RECORD SHEET)

First, I would like to start by asking you some questions about your move to this house.

Q.1. On what date did you move here? WRITE IN DATE AND MONTH BELOW

DATE [ ][ ] 22-23

MONTH [ ][ ] 24-25 Q.2.

SHOW CARD A

Q.2. Where did you move from?

Somewhere else in Milton Keynes	26. 1	Q.3.
Buckinghamshire	2	
Bedfordshire	3	
Northamptonshire	4	Q.4.
Somewhere else in South-East	5	
London/Greater London	6	
Somewhere else in Great Britain	7	
Abroad (Includes S.Ireland)	8	

IF 'Milton Keynes' AT Q.2.

Q.3. How long ago did you first move to Milton Keynes? RECORD ANSWER IN WHOLE YEARS

[ ][ ] 27-28 Q.4.

ASK ALL

Q.4. What was your main reason for moving house when you did?

Q.5.

29. 1.	3.	5.	7.	9.	X.	30. 1.	3.	5.	7.	9.	X.
2.	4.	6.	8.	0.	V.	2.	4.	6.	8.	0.	V.

Q.5. Why did you choose this particular house? PROBE : Why else?

Q.6.

31. 1	3	5	7	9	X	32. 1	3	5	7	9	X
2	4	6	8	0	V	2	4	6	8	0	V

Q.6. What advantages have you found to living in Shenley Lodge?

Low energy/heating costs	33. 1.	
Pleasant looking estate	2.	
Close to countryside	3.	
Near facilities	4.	
Near work	5.	
New	6.	Q.7.
Other (WRITE IN) :	7.	
No advantages	8.	
Don't know	9.	

Q.7. And what problems are there to living here?

Groups of visitors/no privacy	34. 1.	
No road names	2.	
Sites/building incomplete	3.	
Building workers	4.	
Aerogenerator/windmill	5.	
Lack of facilities	6.	Q.8.
Other (WRITE IN :)	7.	
No problems	8.	
Don't know	9.	

Q.9. Do you believe the danger from traffic to pedestrians, children and cyclists on estate roads in Shenley Lodge is ...READ OUT :

...greater than average for Milton Keynes 35.	1	Q.9.
...less than on average for Milton Keynes	2	Q.10.
...or, the same as the rest of Milton Keynes	3	Q.11.
Don't know	4	

IF 'Greater' AT Q.8.

Q.9. Can you tell me why you think the risk is greater?

Contractors' traffic 36.	1.	
Road layout encourages fast cars	2.	
Aerogenerator distracts drivers	3.	
Mud on road	4.	
Landscaping obscures vision	5.	
Road layout dangerous	6.	Q.11.
Other (WRITE IN) :	7.	
Don't know	8.	

IF 'Less' AT Q.8.

Q.10. Can you tell me why you think the risk is less?

Traffic has to drive slowly 37.	1.	
Fewer people/cars here	2.	
Careful drivers	3.	
Safe road layout	4.	
No through roads	5.	
Narrow roads	6.	Q.11.
Other (WRITE IN) :	7.	
Don't know	8.	

ASK ALL

Q.11. As you probably know, there is an aerogenerator - the windmill-like structure - on the edge of the Energy Park. Did you consider the position of the aerogenerator when deciding which house to buy?

Yes 38.	1	Q.12.
No	2	Q.14.
Don't know	3	

IF 'Yes' AT Q.11.

Q.12. Did it affect your choice in any way?

Yes 39.	1	Q.13.
No	2	Q.14.
Don't know	3	

Q.13. In what way did it affect your choice? PROBE FULLY

Q.14.

40.	1.	3.	5.	7.	9.	X.	41.	1.	3.	5.	7.	9.	X.
	2.	4.	6.	8.	0.	V.		2.	4.	6.	8.	0.	V.

ASK ALL

Q.14. INTERVIEWER : CODE SITE YOU ARE WORKING ON

E 42.	1	Q.15.
C	2	
G	3	
1	4	
1A	5	
2	6	Q.27.
4	7	
F	8	
J1	9	

IF ON SITE E, SITE C OR SITE G ASK Q.15.

SHOW CARD B

Q.15. I'd like to know what the selling agents told you about the aerogenerator when you bought this house. Which of these things did they tell you about how long it would be there?

It would be permanent 43.	1	
It would be moved by Summer '87	2	Q.16.
It would be moved in 1 year	3	
It would be moved in 2 years	4	
It would be moved in more than 2 years	5	
Were told nothing	6	Q.17.
Don't know/Can't remember	7	

IF TOLD ANYTHING AT Q.15.

6. Did you specifically ask about this, or did they tell you without you asking?

Specifically asked 44.	1	Q.19.
Told without asking	2	
Don't know/Can't remember	3	

IF 'Told nothing' OR 'Don't know/Can't remember' AT Q.15.

7. Did you have any idea how long it would be there?

Yes 45.	1	Q.18.
No	2	Q.19.
Don't know	3	

IF 'Yes' AT Q.17.

SHOW CARD C

8. How long did you think it would be there for?

It would be permanent 46.	1	
It would be moved by Summer '87	2	
It would be moved in 1 year	3	Q.19.
It would be moved in 2 years	4	
It would be moved in more than 2 years	5	
Don't know	6	

ASK ALL ON SITE E,C AND G

SHOW CARD D

9. Did they say anything about how long the aerogenerator would be working in a 24hr period?

Most or all of the time 47.	1	
About 3/4 of the time	2	
About 1/2 of the time	3	Q.20.
About 1/4 of the time	4	
Less than this	5	
Were told nothing	6	Q.21.
Don't know/Can't remember	7	

IF TOLD ANYTHING AT Q.19.

10. Did you specifically ask about this, or did they tell you without you asking?

Specifically asked 48.	1	Q.23.
Told without asking	2	
Don't know/Can't remember	3	

IF 'Told nothing' OR 'Don't know/Can't remember' AT Q.19.

Q.21. Did you have any idea how long it would be working in a 24hr period?

Yes 49.	1	Q.22.
No	2	Q.23.
Don't know	3	

IF 'Yes' AT Q.21.

SHOW CARD E

Q.22. How long did you think it would be working in a 24hr period?

Most or all of the time 50.	1	
About 3/4 of the time	2	
About 1/2 of the time	3	Q.23.
About 1/4 of the time	4	
Less than this	5	
Don't know	6	

ASK ALL ON SITE E,C AND G

SHOW CARD F

Q.23. Did the selling agents say anything about when the aerogenerator would turn? MULTICODING POSSIBLE

During the day 51.	1,	
During the evening	2,	Q.24.
During the night	3,	
All the time when conditions are suitable	4,	
Were told nothing	5,	Q.25.
Don't know/Can't remember	6,	

IF TOLD ANYTHING AT Q.23.

Q.24. Did you specifically ask about this, or did they tell you without you asking?

Specifically asked 52.	1	
Told without asking	2	Q.27.
Don't know/Can't remember	3	

IF 'Told nothing' OR 'Don't know/Can't remember' AT Q.23.

Q.25. Did you have any idea about when it would turn?

Yes 53.	1	Q.26.
No	2	Q.27.
Don't know	3	

IF 'Yes' AT Q.25.

SHOW CARD G

Q.26. When did you think it would turn?

During the day	54. 1	Q.27.
During the evening	2	
During the night	3	
All the time when conditions are suitable	4	
Don't know	5	

ASK ALL

Q.27. Does the aerogenerator ever disturb you or your family during the daytime, that is between 8a.m. and 6p.m.?

Yes	55. 1	Q.28.
No	2	Q.29.
Don't know	3	

IF 'Yes' AT Q.27.

SHOW CARD H

Q.28. How much would you say it disturbs you during the day?

A lot	56. 1	Q.29.
A little	2	
Occasionally	3	
Not at all	4	
Don't know	5	

ASK ALL

Q.29. Does the aerogenerator ever disturb you or your family during the evening, that is between 6p.m. and 11p.m.?

Yes	57. 1	Q.30.
No	2	Q.31.
Don't know	3	

IF 'Yes' AT Q.29.

SHOW CARD H

Q.30. How much would you say it disturbs you during the evening?

A lot	58. 1	Q.31.
A little	2	
Occasionally	3	
Not at all	4	
Don't know	5	

ASK ALL

Q.31. Does the aerogenerator ever disturb you or your family at night, between 11p.m. and 8a.m.?

Yes	59. 1	
No		
Don't know		

IF 'Yes' AT Q.31.

SHOW CARD H

Q.32. How much would you say it disturbs you at night?

A lot	60. 1	Q.33.
A little	2	
Occasionally	3	
Not at all	4	
Don't know	5	

IF 'Yes' AT Q.27. OR Q.29. OR Q.31. ASK Q.33. ; OTHERS GO TO Q.34.

Q.33. When it disturbs you is it just when it starts up or all the time?

When it starts up	61. 1	Q.34.
All the time	2	
Don't know	3	

ASK ALL

Q.34. Was the aerogenerator working when you visited the estate and decided to buy a house here?

Yes	62. 1	Q.35.
No	2	
Don't know	3	

SHOW CARD I

Q.35. Thinking of what you expected the aerogenerator to sound like before you moved in, which of these statements best describes the actual level of noise?

Much worse than expected	63. 1	Q.36.
Slightly worse than expected	2	
As expected	3	
Slightly better than expected	4	
Much better than expected	5	
Didn't expect any noise	6	
Don't know	7	

SHOW CARD J

Q.36. Which of these words describe the noise made by the aerogenerator? You may use as many words as you like. MULTICODING POSSIBLE

Swishing	64. 1	Q.37.
Humming	2	
Clanking	3	
Whirring	4	
Whining	5	
Howling	6	
Grinding	7	
Creaking	8	
None of these	9	
Don't know	0	

SHOW CARD K

Q.37. Which of these phrases best describes the level of noise made by the aerogenerator when it i turning and....ASK FOR EACH BELOW

	Very noisy	Quite noisy	Quite quiet	Very quiet	Silent	Not experienced this situation	Don't know
You are inside your house with the windows open during the day	65. 1	2	3	4	5	6	7
You are inside your house with the windows open at night	66. 1	2	3	4	5	6	7
You are inside your house with the windows closed in the day	67. 1	2	3	4	5	6	7
You are inside your house with the windows closed at night	68. 1	2	3	4	5	6	7
You are outside in your garden during the day	69. 1	2	3	4	5	6	7

Q.38

IF 'Silent/Not experienced' THROUGHOUT Q.37. SKIP TO Q.39. ; OTHERS ASK

Q.38. Is the noise louder in one particular room or area of the house? WRITE IN BELOW NOISIEST ROOM OR AREA

Q.39.

70. 1.	3.	5.	7.	9.	X.	71. 1.	3.	5.	7.	9.	X.
2.	4.	6.	8.	0.	V.	2.	4.	6.	8.	0.	V.

SHOW CARD L

Q.39. I am going to read out some statements about the aerogenerator and I would like you to tell me, from this card, how much you personally agree or disagree with each.

TICK START AND ASK FOR EACH STATEMENT IN TURN, STARTING AT DIFFERENT STATEMENT FOR EACH INTERVIEW

TICK START READ OUT:	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree	Don't know
(A.) The noise from the aerogenerator disturbs me and my family	72. 1. *	2. *	3.	4.	5.	6.
(B.) The aerogenerator is an attractive landmark	73. 1.	2.	3.	4.	5.	6.
(C.) The aerogenerator looks ugly from this estate	74. 1.	2.	3.	4.	5.	6.
(D.) The aerogenerator is a hazard to passing traffic	75. 1.	2.	3.	4.	5.	6.

Q.40.

IF * 'Tend to agree or Srongly agree' TO STATEMENT A. ASK Q.40. ; OTHERS GO TO Q.41.

Q.40. In what way does the noise disturb you and your family? PROBE FULLY

Q.41.

76. 1.	3.	5.	7.	9.	X.	77. 1.	3.	5.	7.	9.	X.
2.	4.	6.	8.	0.	V.	2.	4.	6.	8.	0.	V.

ASK ALL

Q.41. Do you have any concerns about whether the aerogenerator is safe?

Yes	78. 1	Q.42.
No	2	Q.43.
Never thought about it	3	
Don't know	4	

IF 'Yes' AT Q.41.

Q.42. What concerns you? PROBE FULLY

Q.43.

79. 1.	3.	5.	7.	9.	X.	80. 1.	3.	5.	7.	9.	X.
2.	4.	6.	8.	0.	V.	2.	4.	6.	8.	0.	V.

CARD 2	11. (2)

ASK ALL

Q.43. How many people live at this address?

Respondent only	12. 1	Q.47.
Two or more people	2	Q.44.

IF 'Two or more people' AT Q.43.

Q.44. Have any other members of your household expressed any opinions - either good or bad - about the aerogenerator?

Yes	13. 1	Q.45.
No	2	Q.47.
Don't know	3	

IF 'Yes' AT Q.44.

45. Who was it that expressed an opinion?

WRITE IN RELATIONSHIP TO RESPONDENT IN GRID BELOW

ASK FOR EACH PERSON EXPRESSING AN OPINION AT Q.45.

46. What did...(PERSON AT Q.45.)...say about the aerogenerator?

Q.45. RELATIONSHIP		Q.46. OPINION	
1. _____	14. 1	_____	15. 1
		_____	16. 1
2. _____	17. 1	_____	18. 1
		_____	19. 1
3. _____	20. 1	_____	21. 1
		_____	22. 1

Q.47.

ASK ALL

SHOW CARD M

7. From this card, please tell me how satisfactory you personally find the positioning of the aerogenerator

Very satisfactory	23. 1	Q.50.
Quite satisfactory	2	
Neither satisfactory nor unsatisfactory	3	
Quite unsatisfactory	4	Q.48.
Very unsatisfactory	5	
Don't know	6	Q.50.

IF 'Quite unsatisfactory' OR 'Very unsatisfactory' AT Q.47.

Q.48. Where do you think would be a better place for the aerogenerator to be situated?

_____

_____

Q.49.

24.	1,	3,	5,	7,	9,	X,	25.	1,	3,	5,	7,	9,	X,
	2,	4,	6,	8,	0,	V,		2,	4,	6,	8,	0,	V,

9. Why do you think that would be better?

_____

_____

_____

Q.50.

26.	1,	3,	5,	7,	9,	X,	27.	1,	3,	5,	7,	9,	X,
	2,	4,	6,	8,	0,	V,		2,	4,	6,	8,	0,	V,

ASK ALL

50. Do you think the aerogenerator increases or decreases the market value of your house?

Increases 28.	1	Q.51.
Decreases	2	
Makes no difference	3	Q.52.
Don't know	4	

IF 'Increases' OR 'Decreases' AT Q.50.

51. By what amount do you think the value is increased/decreased?

0 - £500 29.	1	
£501 - £1000	2	
£1001 - £2000	3	
£2001 - £5000	4	Q.52.
Over £5000	5	
Would not be able to sell at all	6	
Don't know	7	

ASK ALL

52. Do you think the presence of the aerogenerator will make it harder or easier to sell your house in the future, or will it make no difference?

Harder 30.	1	Q.53.
Easier	2	
No difference	3	Q.54.
Don't know	4	

IF 'Harder' OR 'Easier' AT Q.52.

53. Why do you say that? PROBE FULLY

Q.54.

31.	1,	3,	5,	7,	9,	X,	32.	1,	3,	5,	7,	9,	X,
	2,	4,	6,	8,	0,	V,		2,	4,	6,	8,	0,	V,

IF HOUSEHOLD NO. 001 - 004, SKIP TO Q.55. ; OTHERS ASK

54. Would you have considered buying this house if it directly backed on to the aerogenerator?

Yes 33.	1	Q.55.
No	2	
Don't know	3	

ASK ALL

Q.55. Thinking of all the things we've been discussing, do you think the aerogenerator should be...(READ OUT)

....left where it is 34.	1	
....moved to a different place away from houses	2	Q.56.
....or, taken away altogether	3	
(DON'T READ OUT):Don't know	4	

Q.56. Does the aerogenerator supply any electricity to your home?

Yes 35.	1	Q.58.
No	2	Q.57.
Don't know	3	

IF 'No/Don't know' AT Q.56.

Q.57. If you were getting cheap electricity from the aerogenerator, would your opinion of it ...READ OUT :

Stay the same 36.	1	
Be more favourable	2	Q.58.
Be less favourable	3	
DON'T READ OUT : Don't know	4	

37. —> 80.

CARD 3	11 (3)

Now some questions about the people who live here.

ASK Q.58. - Q.59. FOR EACH HOUSEHOLD MEMBER IN TURN AND CODE BELOW, STARTING WITH RESPONDENT

Q.58. ESTABLISH SEX, AGE AND WORKING STATUS AND RECORD BELOW

Q.59. Approximately how many hours does ...(PERSON)... spend away from the house on a typical weekday at this time of the year - I mean out of the whole 24 hours? RECORD BELOW

Q.60. Is anybody a shift worker? RECORD BELOW FOR EACH PERSON DOING SHIFT WORK

PERSON NO.	RELATIONSHIP TO RESPONDENT	SEX		AGE									WORKING STATUS OF ALL AGED 16+			Q.59.	Q.60.
		MALE	FEMALE	0-9	10-15	16-24	25-34	35-44	45-54	55-64	65+	REF./ DON'T KNOW	FULL TIME (30+ HRS)	PART TIME (1-29 HRS)	NOT WORK-ING	HOURS OUT OF HOUSE WRITE IN	SHIFT WORKER
1.	RESPONDENT	12.1	2	13.1	2	3	4	5	6	7	8	9	14.1	2	3	15-16	17. 1
2.		18.1	2	19.1	2	3	4	5	6	7	8	9	20.1	2	3	21-22	23. 1
3.		24.1	2	25.1	2	3	4	5	6	7	8	9	26.1	2	3	27-28	29. 1
4.		30.1	2	31.1	2	3	4	5	6	7	8	9	32.1	2	3	33-34	35. 1
5.		36.1	2	37.1	2	3	4	5	6	7	8	9	38.1	2	3	39-40	41. 1
6.		42.1	2	43.1	2	3	4	5	6	7	8	9	44.1	2	3	45-46	47. 1
7.		48.1	2	49.1	2	3	4	5	6	7	8	9	50.1	2	3	51-52	53. 1
8.		54.1	2	55.1	2	3	4	5	6	7	8	9	56.1	2	3	57-58	59. 1

Q.61.

Q 61. OBTAIN OCCUPATION DETAILS OF RESPONDENT

1. Type of organisation

2. Actual job

IF NECESSARY OBTAIN FURTHER DETAILS TO ESTABLISH S.G.

3. Rank/grade (if in Civil Service, Police, etc.) or position in the organisation or self-employed

4. How many people is he/she responsible for? _____

5. How many people work at the same place? _____

6. Qualifications(e.g. apprenticeship,degree, etc.) _____

NOW CODE SOCIAL GRADE OF RESPONDENT

A	60. 1	
B	2	
C1	3	Q.62.
C2	4	
D	5	
E	6	

Q.63.

Q.62. CODE WHETHER RESPONDENT IS HEAD OF HOUSEHOLD

Respondent is head of household	61. 1
Respondent is not head of household	2

3. IF RESPONDENT HAS A PARTNER OR JOINT OWNER AND THEY ARE WORKING COLLECT DETAILS OF THEIR OCCUPATION ; OTHERS GO TO Q.64.

1. Type of organisation

_____

2. Actual job

_____

IF NECESSARY OBTAIN FURTHER DETAILS TO ESTABLISH S.G.

3. Rank/grade (if in Civil Service, Police, etc.) or position in the organisation or self-employe

_____

4. How many people is he/she responsible for? _____

5. How many people work at the same place? _____

6. Qualifications(e.g. apprenticeship,degree, etc.) _____

NOW CODE SOCIAL GRADE OF RESPONDENT'S PARTNER

A	62. 1	
B	2	
C1	3	Q.64.
C2	4	
D	5	
E	6	

Q.64. NOW GO TO FRONT PAGE, COLLECT TELEPHONE NO. AND MAKE SURE YOU FILL IN ALL OTHER DETAILS

JUNE 1987 ENERGY PARK RESIDENTIAL JN.1153-269

INTERVIEWERS INSTRUCTIONS

Background

This survey is being conducted amongst residents of a housing estate in Milton Keynes. All of the houses on the Shenley Lodge estate - also known as the Energy Park - have been built to very high energy standards. Houses on Site C were used as the subject of an exhibition. The survey is predominantly about the aerogenerator - a windmill-like structure which generates electricity from the wind - which is situated at the junction of Watling Street and Faraday Drive. Eventually the aerogenerator will supply nine of the houses on the estate with electricity.

Although aerogenerators have been used before it is a new idea to place them on the edge of a housing estate, and both the Milton Keynes Development Corporation and the Department of the Environment are interested in how it is being received by residents.

Residents were recently told in a newsletter which circulates in Shenley Lodge that someone from BMRB would be coming to talk to them about living in the Energy Park, so you may find that some people are expecting you. If respondents ask for more information about why the survey is being conducted, you may tell them at the end of the interview.

Executive at Head Office

Rosemary Ford is the Associate Director responsible for this project. However, if you have any queries about the survey or your workpack, then you should contact your area office.

What you should receive

With these instructions you should receive:

- 20 questionnaires
- 20 yellow contact questionnaires
- 1 set of prompt cards (A-M)
- 1 set interviewers instructions for contact questionnaires (pink)
- 1 list of addresses (blue)
- 1 street map
- 1 letter of introduction from Milton Keynes Development Corporation
- AMSO leaflets
- 1 Comment sheet

Contact Questionnaire

A separate sheet of instructions has been provided (pink) explaining who you should interview, so that you can refer to it easily.

You should complete a contact questionnaire for each address on your address list. The address, household number area code and whether the address is 'male' or 'female' are all indicated on the address list and you should fill in these details before you go out.

On the doorstep you should use the pink instructions to establish who you should talk to, and you should then code the "household situation" accordingly. You should keep a record of each of your attempts to interview at an address and code the final outcome. You should make <u>at least 4</u> attempts to contact each household.

List of Addresses (Blue)

Some of the addresses on your list may be marked *. This is because these houses have only recently been moved into. Please try to make appointments to interview at these addresses towards the end of your assignment, although by all means contact them earlier.
Give details of the final outcome at each address in the space provided on this sheet.

Please note that the numbering of houses on each road is not always straightforward. It would be wise to <u>check first</u> at each house that you are at the right address.

Letter of introduction

Please write your name in the space provided. You should then carry this letter with you and produce it with your Interviewer's Identity Card for the respondent to look at.

Main questionnaire

The aerogenerator should not be mentioned at all by you until Q.11; the respondent may mention it spontaneously in answer to earlier questions.

Q.3 If less than 6 months write in [0|0]. If 6-11 months write in [0|1].

Q.14 Your address list indicates which site an address is on; you can code this question before you go out.

Q.37 If the noise varies from room to room, ask the respondent to answer for the noisiest room

Q.39 You should start with a different statement at each interview. Tick to show which one you start with.

Q.44 'Other members of your household' includes children, whose views are just as important.

Q.46 You only have room in the grid to record the opinions of 3 household members. If more than 3 are mentioned write down the opinions of the first three mentioned.

Q.58-60 Ask Q.58-59 for each household member in turn, and then ask Q.60.

Q.62 Code whether respondent is head of household - remember women can be heads of households.

Q.63 You should obtain details of the occupation of the respondent's partner or joint owner if they are working. If there is no partner or joint owner, or if they are not working, skip to Q.64.

Comment Sheet

A sheet has been provided for you to tell us any comments you have on this survey.

Return of Work

Please return questionnaires after each day's work to your area office. Make sure contact sheets are securely attached to main questionnaires and return a contact sheet for each address. At the end of your assignment you should also return your address list, map and comment sheet.

CARD A

Somewhere else in Milton Keynes

Buckinghamshire

Bedfordshire

Northamptonshire

Somewhere else in South-East England

London/Greater London

Somewhere else in Great Britain

Abroad

JN.1153-269

CARD B

It would be permanent

It would be moved by Summer '87

It would be moved in 1 year

It would be moved in 2 years

It would be moved in more than 2 years

They didn't say anything about this

JN.1153-269

CARD C

It would be permanent

It would be moved by Summer '87

It would be moved in 1 year

It would be moved in 2 years

It would be moved in more than 2 years

JN.113-269

CARD D

Most or all of the time

About three quarters of the time

About half of the time

About a quarter of the time

Less than this

They didn't say anything about this

JN.1153-269

CARD E

Most or all of the time

About three-quarters of the time

About half of the time

About a quarter of the time

Less than this

JN.1153-269

CARD F

During the day

During the evening

During the night

All the time when conditions are suitable

They didn't say anything about this

JN.1153-269

CARD G

During the day

During the evening

During the night

All the time when conditions are suitable

JN.1153-269

CARD H

A lot

A little

Occasionally

Not at all

JN.1153-269

CARD I

Much worse than expected

Slightly worse than expected

As expected

Slightly better than expected

Much better than expected

JN.1153-269

CARD J

Swishing

Humming

Clanking

Whirring

Whining

Howling

Grinding

Creaking

JN.1153-269

CARD M

Very satisfactory

Quite satisfactory

Neither satisfactory nor unsatisfactory

Quite unsatisfactory

Very unsatisfactory

JN.1153-269

CARD K

Very noisy

Quite noisy

Quite quiet

Very quiet

Silent

JN.1153-269

CARD L

Strongly agree

Tend to agree

Neither agree nor disagree

Tend to disagree

Strongly disagree

JN.1153-269

3. Roadside Fieldwork Documents

ENERGY PARK ROADSIDE INTERVIEWS

1153-270

Interviewer's name _____

CODE: [ ][ ][ ][ ]
8

DATE:

7/7	12.1	[ ]
14/7	2	[ ]
16/7	3	[ ]
18/7	4	[ ]

SITE:

NORTH	13.1	[ ]
SOUTH	2	[ ]

3/5 times a week 1

Q.2 How often do you drive along this road? **READ OUT :**

Daily 32. 1 | Rarely 4
Weekly 2 | First time 5
Monthly 3 | Other 6 | WRITE IN : _____

Q.3 Have you seen any unusual-looking structure in the last half mile?
Yes - windmill /aerogenerator 1
Yes - other 2
No 3
Don't know 4
33

SHOW PHOTOS
Q.6 Can you remember which way it was facing as you drove towards it?
A 1 | C 3 | DK 5
36 B 2 | D 4

Q.7 Was it going round?
Yes 1 | No 2 | DK 3
37

Q.8 INTERVIEWER CODE IF RESP TURNED
Yes 1 | No 2
38

Q.9 How long ago did you first see it?
Over a year ago 1
7 - 12 months 2
4 - 6 months 3
2 - 3 months 4
Last month 5
A week ago 6
Don't know 7
39 Today 8

Q.10 Compared with when you first saw it, do you think the windmill is now... READ OUT :
...more noticeable 1
...less noticeable 2
...about the same 3
...or, no longer noticeable 4
40

Q.11 Some people think that the windmill structure is a distraction for drivers. Do you agree or disagree?
Agree - very distracting 1
- quite distracting 2
Disagree - not distracting 3
41 Don't know 4

Q.12 Do you think it likely or unlikely that the windmill will cause road accidents?
Likely 1
Unlikely 2
Don't know 3
42

Q.13 Would you say the windmill is ....

	Yes	No
A useful landmark for drivers	43.1	44.1
A danger to passing traffic	2	2
Ugly to look at	3	3

Q.4 Did you see a windmill-type structure?
Yes 1
No 2
34 Don't know 3

Q.5 Have you ever seen it?
Yes 1
No 2
35 Don't know 3

CLOSE

45 → 80

Q.1 Why are you going there? (CODE REASON FOR NEXT STOP)

31. 1 Home
2 Work
3 Other business
4 Domestic (e.g. shopping, collecting children
5 School/college
6 Visiting friends/relatives
7 Other leisure/recreation
8 Other

GRE NO. 14 | TIME 18 | OCCUPANTS 22

VEHICLE : Car 24. 1
Van 2
Lorry 3
Motorcycle 4
Other 5

ORIGIN

TOWN FROM : _____ COUNTY _____ 25

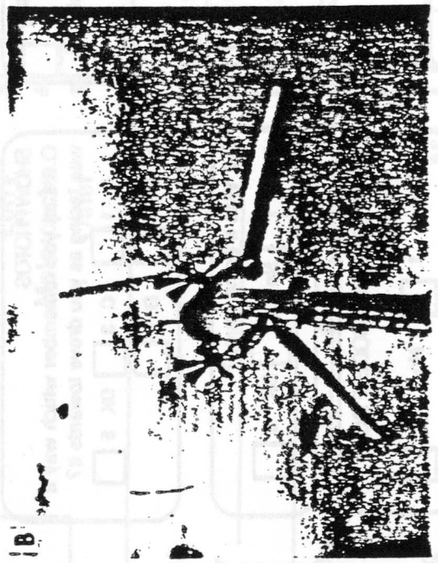
IF MILTON KEYNES /BLETCHLEY ASK WHICH AREA _____

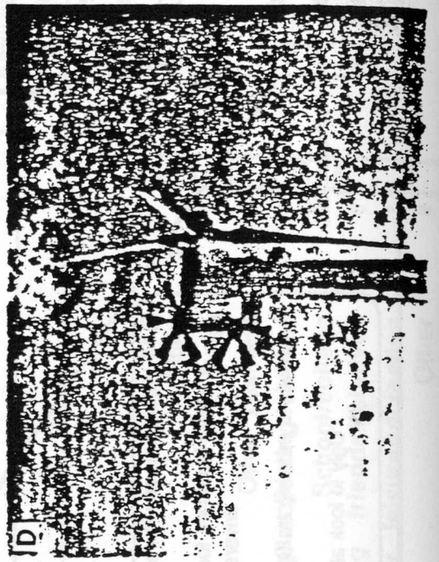
DESTINATION

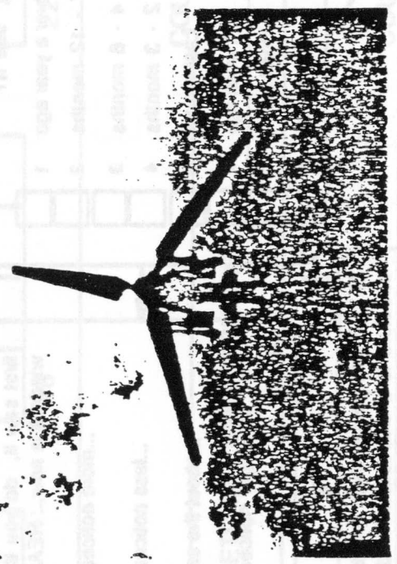
TOWN TO : _____ COUNTY _____ 28

IF MILTON KEYNES /BLETCHLEY ASK WHICH AREA _____

SHOWCARD FOR QUESTION 6







ENERGY PARK ROADSIDE

Notes for Interviewers

You will be working in a team comprising a supervisor and two interviewers as follows:-

Northern Site	Southern Site
Gwen Done	Jackie Tait
Margaret Payne	Mandy Pamplin
Ivy De Broise	Pat Gale

One team will be present on each interviewing site and one police constable. The police constable will stop on-coming traffic and direct the first 3 cars into the interviewing bay. All three interviewers will then step forward and interview the driver of the vehicle. The supervisor will interview the driver of the car at the front of the interviewing bay. When the 2 interviewers have completed their interviews they should ask the driver to wait until the supervisor indicates that it is safe to drive out of the bay and, walking behind the vehicle they have interviewed, step onto the grass verge so that the supervisor can see that they have finished.

The supervisor will then ask the policeman to stop the traffic once again. Once he has done this she will allow all three cars to drive out of the interview bay, and three new cars will be directed into the bay.

The Questionnaire

You will need to fill in the details on the front of the questionnaire only once each day. Each book will contain enough questionnaires for each 4 hour shift.

You should fill in the exact time in the 4 boxes allocated on the front page of the questionnaire at the beginning of each interview.

Origin/Destination sections:

Please get as much accurate information here as you can. Street names are not necessary unless they have driven from or are driving to Bletchley when this may be useful.

Q.1 Please code the reason for the next stop e.g. if the driver was going to work, but was dropping a child off at school on the way, you should code "school, college".

Q.3 If the respondent mentions the windmill at all here, you should go straight to Q.6.

Q.8 Here you should code whether the respondent turned to check when answering Q.7. You must tick one box here, either 'yes' or 'no'.

Q.9 Anybody answering "Today" at Q.9 goes straight to Q.11. All other answers, including 'Don't know', go to Q.10.

Q.10 You should read out all 4 possible answers to this question, including "or, no longer noticeable".

Q.13 You should read out each statement in turn, allowing the respondent time to answer 'yes' or 'no' to each statement before moving on to the next.

Refusals

A driver may, of course, refuse to answer your questions but you should tell them that they will have to wait until the other interviews have been completed before they can leave the interviewing bay.

If someone does refuse to be interviewed please take as many details as possible i.e. time, no. of occupants and type of vehicle, and write "refused" across the rest of the questionnaire.

Other things to remember:-

1. Before commencing interviewing it is important that all 6 interviewers synchronise their watches.

2. Parking spaces for interviewers cars is shown on the map of Shenley Lodge and the surrounding area. Also marked is 11, Silicon Court where a toilet is available for interviewers.

3. You will be allowed a 30 minute break during the 4 hour shift. Your supervisor will be responsible for administering the breaks.

4. Flourescent jackets will be issued on arrival at the site. You should wear these whenever you are on or near the interview site.

5. Please always exercise extreme caution when on the interview site.

MEASUREMENT OF NOISE AND ASSESSMENT OF LIKELY DISTURBANCE DUE TO NOISE FROM A 20 KW WIND TURBINE GENERATOR AT MILTON KEYNES

By

J N PINDER
SENIOR CONSULTING ENGINEER

and

M A PRICE
ASSISTANT CONSULTING ENGINEER

WOLFSON UNIT FOR NOISE AND VIBRATION CONTROL
THE UNIVERSITY
SOUTHAMPTON SO9 5NH

This work was funded by the Department of Energy through the Energy Technology Support Unit, Harwell under Agreement No E/5A/CON/5066/1517. The work complements the Social Survey carried out by Milton Keynes Development Corporation under the Agreement No E/5A/CON/5097/1758.

APRIL 1988

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CONTENTS

0.0 SUMMARY

Noise levels produced by the aerogenerator at Shenley Lodge, Milton Keynes were measured at various locations within 155m of the aerogenerator. The report presents these measurements in terms of overall levels and representative spectra.

The generator is a three-bladed, upwind horizontal axis machine, rated at 20 Kw output.

In the absence of a specific rating method the likelihood of residents experiencing disturbances as a result of the aerogenerator noise was assessed using the method given in the British Standard 4142 for mixed residential and industrial areas. Using this method, the aerogenerator noise is concluded to be such that complaints could be expected from residents at all the measurement locations at night and at most of the locations at other times. The aerogenerator would have to be placed 600m from houses in order to rate as of marginal significance with respect to the likelihood of complaints from residents. However, from a subjective assessment including downwind conditions, it is concluded that this situation would be achieved at a rather shorter distance, in the approximate range 350 to 400m.

The main source of noise is of mechanical origin, dominated by a distinctive component at about 470 Hz.

A preliminary assessment of the two main noise sources, mechanical and aerodynamic noise, indicates that even if the mechanical noise were eliminated, the aerogenerator should not be placed within 80m of residential development.

Following receipt of this report and consideration of its findings, Milton Keynes Development Corporation concluded that the aerogenerator, in its current location, was a noise nuisance for local residents and therefore a further application to extend the planning permission could not be supported. Discussions are currently ongoing with the owners of the aerogenerator to relocate it in a more suitable location.

1.0 BACKGROUND

A small (20 kW) aerogenerator has been constructed on a site between the V4 Watling Street and a new housing development in the Shenley Lodge area of the Milton Keynes Energy Park. The aerogenerator is operated by Solapak Ltd as part of a wind/solar energy pilot project supplying electricity to nine houses on the Shenley Lodge Estate. It is of a three bladed construction, the tower is 18m high and the blade diamater is 13m (see Appendix 1). The tower is a tubular steel pylon.

This report forms part of an exercise initiated by the Milton Keynes Development Corporation, funded by the Energy Technology Support Unit (ETSU: Agreement No. E/5A/CON/5066/1517), to assess potential noise disturbance to the residents of Shenley Lodge caused by the aerogenerator. In addition a subjective assessment was made in the form of a survey of residents compiled by the Strategic Planning Department of Milton Keynes Development Corporation [Ref 1].

At the outset of the noise survey it was intended that several sets of measurements should be made under different wind conditions. However, the aerogenerator was out of operation for most of the study period due either to a lack of wind or to technical faults on the machine itself. This report is therefore based mainly on measurements made on one day under a particular set of environmental conditions with some additional measurements from two other days.

2.0 NOISE SURVEY METHOD AND SITE CONDITIONS

Tape recordings were made at various locations in the Shenley Lodge area on the evening of 8 October 1987. The recordings were made between 8 pm and 1 am to minimise the effect of background noise, mainly from the V4 road, and to record the levels at the time of day when the aerogenerator is likely to be most intrusive. Figure 1 shows the locations at which recordings were made and the recordings made are listed in Table 1. A limited number of measurements were also made on 14 May 1987, at locations M2, M4, M6 and M10, and on 21 May 1987 at locations M8a, M8b and M6. These measurements were made earlier in the evening with an associated higher background noise. In both cases the aerogenerator was inoperative after 8 pm. The locations were chosen as representative of places from which the aerogenerator was clearly audible, at a range of distances from the aerogenerator and at different angles relative to its axes.

Table 2 gives detailed wind conditions for 8 October obtained from the Open University which monitors windspeed and direction at hub-height. An estimate of conditions was made for the other two days based on readings from the wind vane on the community centre roof (near M6), the operating conditions of the aerogenerator and a hand held anemometer. It should be noted that the hourly averages underestimate the actual windspeed while the aerogenerator is operating. The aerogenerator only operates at 6 m/s and higher. On 8 October and 14 May the aerogenerator was stopping then starting up automatically and running continuously for significant periods indicating that although winds were variable, speeds of at least 6 m/s were maintained for signficiant periods of time.

Although measurements were made only in light wind conditions, it is believed these are among the most critical conditions because masking noise due to the wind alone is very low near the ground and therefore the protrusion of aerogenerator noise will be high. Also, mechanical noise which dominates in this case, is likely to be of the same order for variably loaded gearing with some backlash as for the heavier but evenly loaded gearing, occurring at higher windspeeds.

3.0 SUBJECTIVE DESCRIPTION OF AEROGENERATOR NOISE

On 8 October 1987 the measurements were started at about 8.20 pm by which time the evening rush period was over and traffic noise had therefore diminished. There was, however, a signficant amount of traffic on the V4 road, with short gaps between the vehicles, when the aerogenerator was clearly audible.

Close to the aerogenerator a 'swishing' sound could be heard as well as a mid-frequency whine or howl which varied with time, apparently reaching a peak once per revolution of the blades. The swishing sound seemed loudest three times per revolution, corresponding to blade passing frequency. A short period of high frequency whistle or squeal is also apparent once per revolution.

The tonal whine is the dominant characteristic and could be heard at all measurement locations on all three days whereas the range of blade swish was more limited, not being audible at the most distant location, 51 Silicon Court (M4). The whine was also observed from 35 Runford Court on all three days although no measurements were made from this location, which is about 180m to the west of the aerogenerator. The whine is apparent at distances of at least 300m downwind of the machine when background noise is low. The quality and level of this component vary significantly under light load conditions. The stopping and starting of the machine at low windspeeds close to the minimum required by the machine, produced a variation in the whine with its frequency and level increasing as the speed of the machine increased.

4.0 MEASURED SOUND LEVELS

4.1 Time History Characteristics (Figures 2 to 6)

Figure 2 shows the level recorder output (A weighted sound pressure level) of part of the recorded period at four measurement locations. These illustrate the modulation of the overall sound level, ie cyclic variation in level with time. The levels peak approximately once per second (70 times per minute). Observation shows that the sound level peaks once per complete revolution of the rotor, ie the rotor speed is 70 rpm which is close to the rated speed quoted by the manufacturer. The trace at 22 Grantham Court (M2) shows a particularly clear pattern of peaks and dips while the levels at 11 Grantham Court (M1) and 51 Silicon Court (M4) are affected rather more by other noise sources. At 11 Grantham Court the other noise sources are both environmental noise and other sounds from the aerogenerator which do not coincide with the main modulated sounds at 70 rpm. This includes a component which is modulated at 210 rpm, ie the "blade passing frequency". It is a 'swishing' sound probably caused by the aerodynamic interaction between the individual blades and the support tower. The levels at 51 Silicon Court are not much greater than the background noise as can be seen in Figure 3 but the 70 rpm modulation is visible indicating that the aerogenerator noise is still measureable at this distance (155m).

Figures 4 to 6 show the level recorder output from part of the tape recordings made at the other locations on 8 October 1987. These are analysed using a more compressed time scale and are over a longer period of time than those of Figures 2 to 3. These figures give the results for various operating conditions including starting and stopping and a comparison between the aerogenerator noise and the background noise, when the aerogenerator is not operating. The 70 rpm modulation is clearly shown as peaks approximately 1 mm apart in the periods when the aerogenerator is operating, at all the measurement locations, being particularly marked at the locations close to the aerogenerator. At these locations, there are periods when the range of modulation is reduced, believed to correspond to different loading conditions as the wind speed or electrical load varies.

The background level of between 40 and 50 dB(A), apart from the traffic noise peak, measured at location M6 is likely to be similar at M5. Comparison with the noise levels of the aerogenerator alone indicates that the aerogenerator increases the noise levels by approximately 10 dB and thus that the aerogenerator is the main contributor to the overall levels at these locations.

4.2 Statistical Noise Levels (Table 3)

Statistical means are available to describe time varying noises such as those illustrated in Figures 2 to 6. Commonly used is the L_{Aeq}, ie the equivalent continuous sound level; the steady dB(A) level which would produce the same A-weighted sound energy over a stated period of time as the time-varying sound. Percentile levels are also used such as L_{90} and L_{50} which are the levels exceeded for 90% and 50% of the time period, respectively. The L_{A90} is commonly used to describe ambient, or background, noise levels. Examination of the level recorder trace of the aerogenerator noise suggests that L_{Aeq} or L_{A50} would be good descriptors of the aerogenerator noise for comparison with background levels and assessment of annoyance. Table 3 shows that several of the signals recorded on 8 October give numerically similar values of L_{A50} and L_{Aeq} for the aerogenerator.

Table 3 compares L_{Aeq} values with L_{A50} and an approximate level taken from Figures 2 to 6 obtained by 'averaging by eye' the levels from the level recorder trace in a manner analogous to the eye-averaging of a meter recommended by BS 4142 (Section 6). These levels and the L_{A50} levels were generally within 1 or 2 dB of the L_{Aeq} values, suggesting that it is reasonble to use L_{Aeq} values as a true representation of the noise measured from the aerogenerator at each locaiton. Some L_{Aeq} and L_{A50} background noise levels are also given.

The L_{Aeq} and L_{A50} values are for periods of about one to three minutes when the aerogenerator was dominant throughout. The background levels were recorded in periods of a lower windspeed, ie when the aerogenerator had stopped and the background noise is evidently not constant. These levels do not therefore give a direct comparison between the 'with' and 'without' aerogenerator case, as would be desirable, but do serve to indicate the ambient levels on this site during the evening period at

only a slightly lower wind speed than when the generator runs. They also show that the levels recorded during the operation of the aerogenerator are significantly above the ambient levels, except perhaps at 51 Silicon Court (M4) where, as observed earlier, the aerogenerator, although audible, does not dominate the overall A-weighted levels. The measurements made on the other two days were influenced too much by high background levels to give meaningful statistical parameters.

The decrease in L_{Aeq} levels with distance is illustrated in Figure 7. The levels appear to reduce at a rate of approximately 6 decibels per doubling of distance (6 db/dd) as shown by the line drawn on the graph. This is the rate of sound attenuation due to the geometric divergence effect, known as 'spherical spreading', ie the propagation of sound from a point source. The level of this line is set by eye to illustrate the trend in the data. The L_{Aeq} level at 51 Silicon Court (M4) does not conform so well to this pattern. This point was upwind of the aerogenerator and also shielded from a direct line of sight of it by an intervening building. These effects combine to give an increased rate of attenuation at this point. The level of the 6 dB/dd line does, in fact, give the best fit to the data (least mean square fit) if the M4 point is excluded.

5.0 SPECTRAL CONTENT OF AEROGENERATOR NOISE (FIGURES 8 TO 24)

5.1 Spectral Characteristics

The recordings were analysed using a frequency analyser (Brüel and Kjaer type 2131) to give a narrow band frequency spectrum of the sound recorded at each location.

Figure 8 shows the frequency spectrum of the noise recorded at 11 Grantham Court (M1) on 8 October while the aerogenerator was operating. The most obvious features of this spectrum are that most of the energy is concentrated in the low frequency part of the spectrum and includes 3 sharp peaks at low frequency. In order to investigate the peaks in more detail, the same measurement was analysed over a more limited frequency range as shown in Figure 9.

Figure 9 is the result of averaging about 43 seconds of the sample, avoiding the part of the signal with high levels of traffic noise. There are two main peaks at around 470 Hz and 940 Hz, respectively. Figure 9 also exhibits peaks at frequencies between the two main peaks and at lower frequencies. The main peaks clearly dominate the overall sound levels as they are 10 to 20 dB higher than most of the rest of the spectrum. The low frequency peak (below about 100 Hz) is not a noticeable component on site. Its protrusion is apparently enhanced by the effect of 'C' weighting which was applied to reduce wind noise by filtering below about 60 Hz.

The spectrum of Figure 9 appears to be dominated by the aerogenerator noise, particularly the tonal component at 470 Hz but aerodynamic noise is also audible, as well as the high pitched whistle which occurs once per revolution. The aerodynamic noise is generally broad-band in character, ie it is not concentrated in a sharp peak. The two main peaks of Figures 9 and 10 originate from the mechanism of the aerogenerator rather than from the blades, whereas the smaller, broader, peaks are attributable to aerodynamic noise. The whistle components are not discernible on a time averaged spectrum, but it was established by the filtering technique described below that the main component was at 3100 Hz.

Representative spectra of the recordings made at the other locations are shown in Figures 10 to 18. Figure 10 shows the levels recorded on 8 October at the farthest measurement location, ie 51 Silicon Court (M4) which is about 130m from the aerogenerator and upwind of it. The peak at 470 Hz is apparent at this location being approximately 20 dB above the levels of the frequencies on either side of it. The peak is about 24 dB lower than the equivalent peak at 11 Grantham Court (M1) in Figure 9 and the rest of the spectrum is similarly about 20 dB lower. The effect of distance from the aerogenerator is the cause of this decrease and the parts of the spectrum other than the 470 Hz tone are reduced to the level of the background noise, or below. Thus only the tone is audible at this location. Figures 8 to 11 are 'C' weighted and Figures 12 to 18 are 'A' weighted.

Figure 19 shows the measured decrease in the level of the main peak due to distance taken from Figures 9 to 18 and similar spectra for the other measurement days. Superimposed is a line indicating an attenuation rate of 6 dB per doubling of distance. This indicates a trend which is in general agreement with the behaviour of the L_{Aeq} levels described in Figure 7. The scatter in the data is however quite large indicating variations between the measurement occasions. In particular, the level at 51 Silicon Court (M4) was higher on 14 May than on 8 October. This is expected to be due predominantly to the difference in wind direction since on 8 October this location was upwind of the source and could have been in a so called 'shadow zone' caused by the combined effects of refraction in the presence of wind and shielding by the intervening building. On 14 May, 51 Silicon Court was downwind of the aerogenerator. Thus the downward refraction of the sound over the buildings could negate any shielding effect, restoring the pattern of 6 dB per doubling of distance. A similar discrepancy between the 6 dB/dd line and the L_{Aeq} at this location is also evident in Figure 7.

In the unshielded locations, the difference between the upwind and downwind situations is less marked, generally showing a slightly lower level in the downwind situation. The information is considered insufficient to draw definite conclusions on the effect of wind direction. It is assumed that the effect will be small.

5.2 Influence of Prominent Spectral Components

A second peak in the frequency spectrum at approximately 940 Hz can be seen at some locations. This frequency is the second harmonic of the 470 Hz tone. Both are caused by mechanical noise of the mechansisms contained with the nacelle. Work is currently being carried out by WUNVC, for The Department of Energy, through ETSU, to identify the source of this noise and its transmission path. This will allow the consideration of the use of noise control techniques to reduce this source which is not inherent to the operation of the aerogenerator. The aerodynamic noise is fundamental to the design of the aerogenerator, ie the blades passing through the air do produce some noise, and this is mostly broad-band noise. Its contribution is being estimated in the noise source investigation, using the method developed under Reference 4.

A whistle is produced by one of the blades (main component at about 3100 Hz). It has been suggested that this is probably due to the misalignment of the blade tip and could be remedied if this blade were modified to be the same as the two which do not seem to whistle.

Since most of the noise produced by the aerogenerator is concentrated in the peak at 470 Hz, an investigation of its subjective contribution was carried out using a 'notch filter' which effectively filters out a narrow band of the spectrum. The notch was centred on 470 hz and its shape is shown in Figure 20. This shows that the frequencies around 470 Hz are reduced by up to about 30 dB. Figures 21 and 22 show the aerogenerator spectrum at one of the closest microphone locations (M8b) unfiltered and filtered respectively. The notch does not filter out the higher order harmonics, such as at 940 Hz, as would any real noise control methods applied to reduce the 470 Hz tone. However, due to its bandwidth, the filter also reduces noise which is not directly attributable to this peak and reduces the levels at some frequencies below the levels of the true ambient noise. This experimemt is therefore only an indication of the contributions of sources other than the 470 Hz mechanical noise to the overall noise output from the aerogenerator.

Figures 23 and 24 show a similar pair of spectra for the signal recorded outside 10 Faraday Drive (M5), which is approximately 110m upwind of the aerogenerator. The 470 Hz tone is more than 20 dB above the levels of surrounding frequencies and the harmonic at 940 Hz is a peak of about 15 dB, the third and fourth harmonics are also visible (1410 Hz and 1880 Hz) but at a low level. The broad-band noise was above the background suggesting contributions from the aerodynamic noise.

Figure 25 shows the effect of the notch filter on the overall dB(A) levels at the location M8b close to the aerogenerator. The levels are from exactly the same part of the recording with the notch filter simply switched off or on. The overall level of the noise drops when the filter is applied, even where the traffic noise causes a peak, indicating that the aerogenerator tone adds to the overall levels even when a vehicle is passing. The modulation is almost entirely absent in the level recorder trace with the filter, indicating that the character of the sound is changed considerably as well as the level.

Subjectively, with the filter applied the recording from 10 Faraday Drive (M5) still has some narrow band character with a modulation of 70 rpm (once per revolution) due to the higher order harmonics, although the main tone is absent. The aerodynamic 'swish' is also only faintly audible. The whistle occurring once per recvolution can be heard at this location. Table 4 gives the statistical noise parameters for the two locations with and without the notch filter.

The results in Table 4 show the extent to which removing the first harmonic of the mechanical noise tone by application of the notch filter reduces the measured overall levels. The differences are greater at the more distant microphone, because the level at location M8b is affected more by the parts of the aerogenerator noise outside the main peak than at the further distance where the levels of the aerodynanmic noise are not far above the background levels. Reducing the noise output at 470 Hz would thus reduce the overall levels by 5 to 8 dB(A). At more distant, or sheltered locations such as 51 Silicon Court this tone is the only component audible and a reduction of 5 to 8 dB(A) in the level would bring the overall level from the aerogenerator well below the background levels, and is likely to render the aerogenerator inaudible.

6.0 ASSESSMENT OF ANNOYANCE USING BS 4142

6.1 Rating Methods

Two general measurement methods are available for environmental noise, BS 4142 [Ref 2] and ISO 1996 [Ref 3]. The latest version of ISO 1996 does not give rating guidance in addition, as does BS 4142. Although the latter specifically applies to 'mixed residential and industrial areas', it has become more widely applied as a simple guidance method. In the absence of any more specific rating method applicable to wind turbine generators, the measurements at Milton Keynes have been rated using BS 4142 to allow comparison with the results of the social survey.

The result of this comparison then provides some evidence concerning the possible application of BS 4142 in similar circumstances. The noise measurement units presented are expected to be general enough to be applicable to other simple methods which may be derived in the future for assessing disturbance from wind turbine noise.

The British Standard BS 4142 "Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas" [Ref 2] states that complaints (indicative of annoyance) may be expected if the 'corrected' level of total noise when the source of concern operates exceeds the background level by 10 dB(A) or more (an excess of up to 5 dB(A) is considered to be of marginal significance). The relevant background level is the L_{A90} and with care the noise can be described as the L_{Aeq} since an average level is required.

Although L_{Aeq} is not yet established in general as a measure appropriate to rating disturbance or annoyance, it is considered that its use in this case is an acceptable alternative to the eye-averging of meter indications recommended in rating methods such as BS 4142 [Ref 2] so long as the noise level is dominated by the source of concern and when the range is small (less than about 10 dB). L_{Aeq} is specified as the rating level in ISO 1996 [Ref 3].

With regard to background noise, BS 4142 recommends the use of L_{A90}, whereas ISO 1996 (using the term residual noise), by not advocating any specific measurement unit, appears to propose the use of L_{Aeq}.

6.2 Application of BS 4142

The results from Table 3 indicate an L_{A90} background level of about 43 dB(A) for the Grantham Court area during the evening and rather less than this around midnight and at Silicon Court. For the purposes of estimating annoyance from the aerogenerator an L_{A90} of 43 dB(A) for the evening and 38 dB(A) at night is considered to be appropriate. BS 4142 assumes 5 dB difference between evening and day-time background levels, therefore the day-time background level is also estimated at 5 dB above the measured evening level This may rather underestimate the background during periods of heavy traffic flow on the V4 road.

BS 4142 also includes a correction for the character of the noise such that if the noise has a definite distinguishable continuous tonal component then a corrected level of 5 dB(A) more than the measured level should be used. This correction is judged clearly to be applicable to the aerogenerator noise at all locations surveyed. Figure 26 shows the corrected level at each of the locations (measured L_{Aeq} + 5 dB(A)) and the relevant background L_{A90} + 10 dB(A) as the level at which complaints would be expected. It is evident that the tonal character may cause annoyance at night-time at all the measurement locations and at all times of the day at locations closer than about 100m.

No correction has been given for intermittent running during a day-time or night-time period. BS 4142 does not allow a correction for occasional running, to account for some periods which do not include any aerogenerator operation. Although both levels of intermittency occurred extensively in practice, continuous running through a period is the intended operation, wind conditions permitting.

In fact, the short-term intermittency should not have a beneficial influence on the rating as the character of the start-up has been rated as very disturbing at some locations [Ref 1], but there is no provision in BS 4142 for multiple application of noise character corrections.

An example of rating one location is shown in Table 5.

Extrapolation of the data using a best fit 6 dB per doubling of distance line as described above indicates that the aerogenerator would cause the likelihood of complaints at night up to 350m away where there is a direct line of sight. To reduce the likelihood to marginal levels, the distance must be increased to 600m, as the criterion becomes L_{A90} + 5 dB(A).

Figure 26 also shows the L_{Aeq} levels for the analyses carried out using the notch filter. The correction for a tonal character has not been added since the remaining noise is expected to become relatively broad-band if real noise control measures give this level of reduction in overall noise. These two results indicate that if the corrected noise level were to be reduced in this way, only the residents of the very closest houses such as 11 Grantham Court would be significantly annoyed by the aerogenerator, and houses 120m from it would be marginally affected. The notch filter analysis is, as noted above, only an indication of the possible benefits of mechanical noise control. It is uncertain how much reduction of the currently dominant mechanical noise can be achieved by practical noise control measures.

7.0 COMPARISON WITH SOCIAL SURVEY

The assessment of the annoyance expected from the aerogenerator is broadly in agreement with the social survey carried out by MKDC [Ref 1], which found that a significant number of the residents were disturbed by the aerogenerator noise. The social survey concluded that residents within approximately 130m are those most disturbed by it, particularly at night but significant disturbance was also reported during the day and evening. The residents living within 25m of the aerogenerator all reported very high levels of disturbance and want the aerogenerator to be moved, as do most of the residents living within 130m of it.

The character of the noise is also indicated by the social survey, most of those disturbed describing the sound as a whirring or whining sound, but a swishing noise was also mentioned by many of the people disturbed by it, suggesting that even without the mechanical noise the aerogenerator could cause disturbance by the swishing of the aerodynamic noise. The survey also indicated that the start-up of the aerogenerator is a significant cause of annoyance, due to the fact that the dominant tone gradually increases in frequency under the influence of the powered starting mechanism, giving a particularly distinctive, loud noise, which is particularly troublesome when the wind speed is only marginally high enough to operate the aerogenerator and it is continuously starting up and then stopping.

The assessment following BS 4142 indicates that significant disturbance could be expected at distances of up to 250m, and certainly at 155m (location M4). The social survey, however, indicates that the residents living more than 130m from the aerogenerator reported low levels of dissatisfaction. This difference may be largely due to the intermittent running of the aerogenerator, due not only to wind conditions, during the period of the social surveys compared with the intended periods of continuous running which were assumed in the BS 4142 rating.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 The noise measurements show that levels of up to 70 dB(A) L_{Aeq} were experienced by residents of the closest houses when the aerogenerator was operating. The character of the noise is such that the effective levels are even higher.

8.2 It is clear that these levels are unacceptable as indicated both by the social survey and the assessment in accordance with BS 4142. All the measurement locations were assessed by BS 4142 as being 'annoyed' at night with those 100m or less from the aerogenerator likely to experience annoyance during the day-time as well.

8.3 The BS 4142 assessment possibly overestimates the disturbance effect at distances of 150m or more since the social survey does not concur with the expectation of disturbance at these distances. However, if the aerogenerator had been operative more continuously during the period of the social survey, we believe that a higher level of dissatisfaction would have been reported. Even so, BS 4142 probably still gives a rather pessimistic view of the separation distance required to achieve a marginal significance, when compared with the low levels of disturbance shown by the social survey at closer locations. Thus it is our opinion that observations made at 300m, the BS 4142 assessment and the social survey together suggest that a separation distance of 350 to 400m from any residential development would give marginal risk of complaints.

8.4 A rate of attenuation of the aerogenerator noise of approximately 6 dB per doubling of distance occurs in the absence of shielding effects. Shielding effects cannot be relied on to reduce the noise from the aerogenerator since in a downwind situation the sound could be refracted over any obstacle.

8.5 Preliminary assessment of the possible effects of noise control, using a notch filter indicates that the radius within which disturbance occurs could be much reduced by reducing or eliminating the dominant mechanical noise. The existing aerogenerator is predicted by BS 4142 as likely to give rise to complaints from residents living up to 350m from it whereas with the mechanical noise reduced, the aerogenerator could become acceptable within about 80m.

Even without the dominant mechanical tone this aerogenerator would be sited too close to residential properties, the closest being 20m at present.

8.6 It would seem expedient to move the aerogenerator to a more remote location. If noise control measures are implemented to reduce the 470 Hz component, the noise level must be re-measured to enable the required distance between the aerogenerator and housing to be estimated. This distance is unlikely to be less than 80m.

9.0 REFERENCES

9.1 Social Implications of a Wind Driven Generator in a Domestic Situation.
Strategic Planning Department, MKDC, December 1987.

9.2 British Standard 4142 : 1967
Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas.
British Standards Institution, London.

9.3 International Standard 1996
Acoustics - Description and Measurement of Environmental Noise.
International Standard Organisation, Geneva, 1982.

9.4 Noise Prediction for Wind Turbines; Project Profile 034,
Renewable Energy Enquiries Bureau
ETSU, Harwell Laboratory.

Location	Description	Approximate Distance from Aerogenerator	Microphone Height	Time
M1	11 Grantham Court	17m	4m	20:20
M2	22 Grantham Court	80m	4m	20:50
M3	28 Grantham Court	93m	4m/1.2m	21:25
M4	51 Silicon Court	155m	4m	22:05
M5	Faraday Drive (outside No 10)	110m	1.2m	23:00
M6	Faraday Drive (Community Centre carpark)	67m	1.2m	22:30
M7	Opposite side of V4	103m	1.2m	24:00
M8a	Close to aerogenerator	22m	1.2m	23:20
M8b	beside Faraday Drive sign	21m	1.2m	23:40
M9	Close to WTG beside V4	15.5m	1.2m	23:50
M10	Outside 4 Faraday Drive (14 May 1987 only)	64m	1.2m	

Table 1 - Summary of Recordings Made

8 October 1987 - 1 hourly averages at 10m height

Time	Speed	Direction
20:00 - 21:00	3.7 m/s	236°
21:00 - 22:00	4.0 m/s	217°
22:00 - 23:00	4.2 m/s	219°
23:00 - 24:00	4.4 m/s	216°

Wind at hub-height during measurements

Date	Speed	Direction
14 May 1987	5 - 7 m/s	N
21 May 1987	≥ 6 m/s	N - NE

Table 2 - Wind Conditions

Location	Description	L_{Aeq}	L_{A50}	L_A*
M1	11 Grantham Court	70	70	69
M2	22 Grantham Court	57	57	56
M3	28 Grantham Court	57	55	54
M4	51 Silicon Court	46	45	47
M5	10 Faraday Drive	52	52	52
M6	Car Park	60	60	61
M7	Across V4	55	60	53
M8a	Close to aerogenerator	66	65	65
M8b		66	64	65
M9	Alongside V4	69	68	68

Background

Location	Approximate Time	Time period (BS 4142)	L_{Aeq}	L_{A90}
M2	21:00	Evening	48	44
M3	21:10	Evening	44	43
M4	22:20	Night	42	40
M7	24:00	Night	43	38

* = Eye-averaged from Figures 2 to 6

Table 3 - Measured Noise Levels (dB(A) re 20 µPa)

Location	Description	L_{Aeq}	L_{A50}	L_A*
M8b	Without Filter	66	64	64
	With Filter	61	57	59
	Difference	**5**	**7**	**5**
M5	Without Filter	52	52	
	With Filter	44	42	
	Difference	**8**	**10**	

* = Eye-averaged from Figure 25

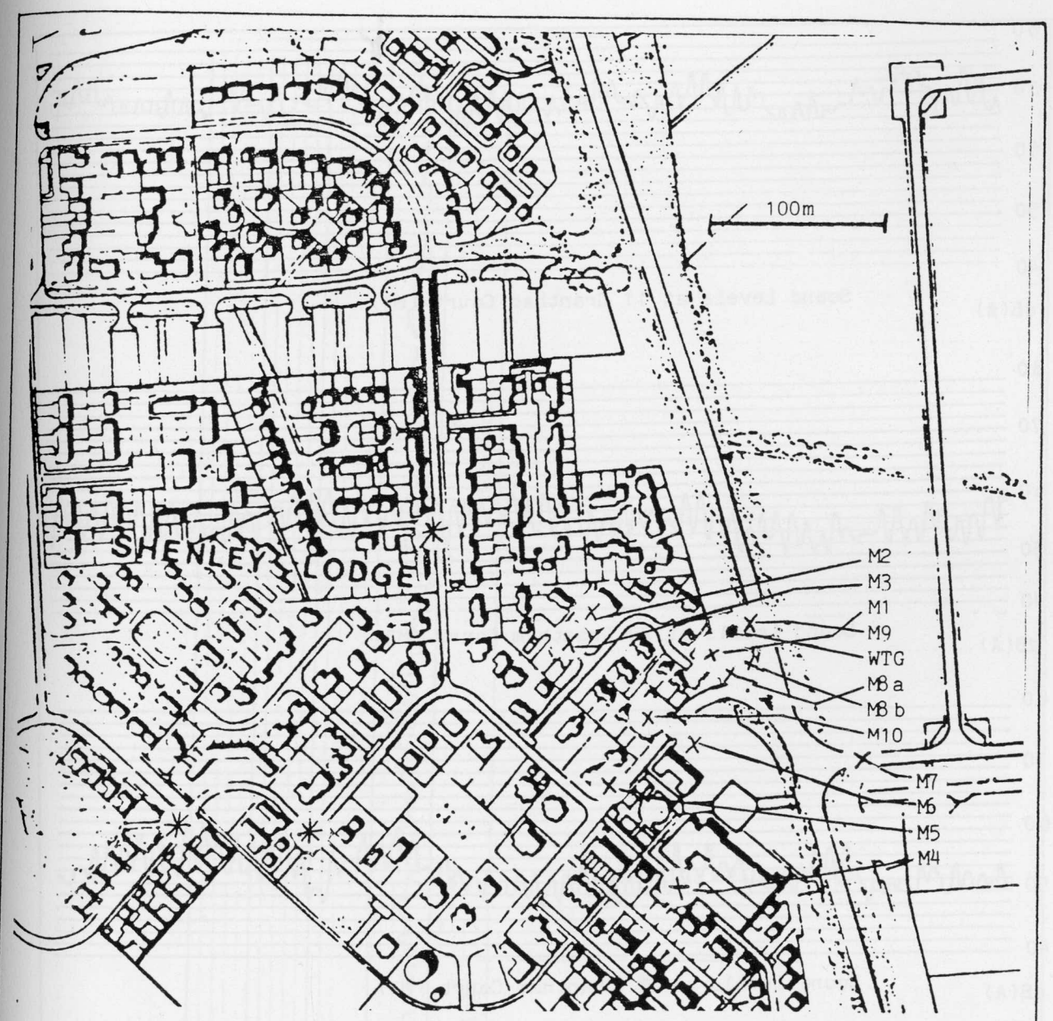
Table 4 - Result of Notch Filter on Overall Levels (dB(A) re 20 µPa)

	Evening	Night
Measured Noise Level (L_{Aeq})	52	52
Tonal Correction	+5	+5
Intermittency Correction	0	0
Corrected Noise Level	57	57
Background Level (L_{A90}) (Measured)	43	38
Corrected Noise Level minus Background	14	19
Conclusion	**Complaints Likely**	**Complaints Likely**

Table 5 - Rating of Aerogenerator Noise in Accordance with BS 4142:1967 at Location M5 (Faraday Drive)

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

project	MILTON KEYNES AEROGENERATOR	no.	3323
title	Measurement Locations.	date	8 Oct 87



KEY.

⊗ = Microphone location.

✳ = Other locations from which aerogenerator is audible.

Approximate wind direction during measurements.

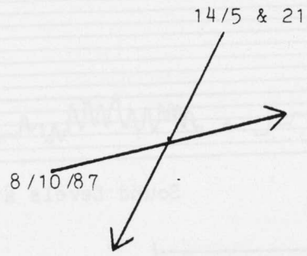


FIGURE 1.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

project	MILTON KEYNES AEROGENERATOR	no.	3323
title	Sound pressure levels at M1, M2, M3 and M4.	date	8 Oct 87

(dB(A) re 20μ Pa)

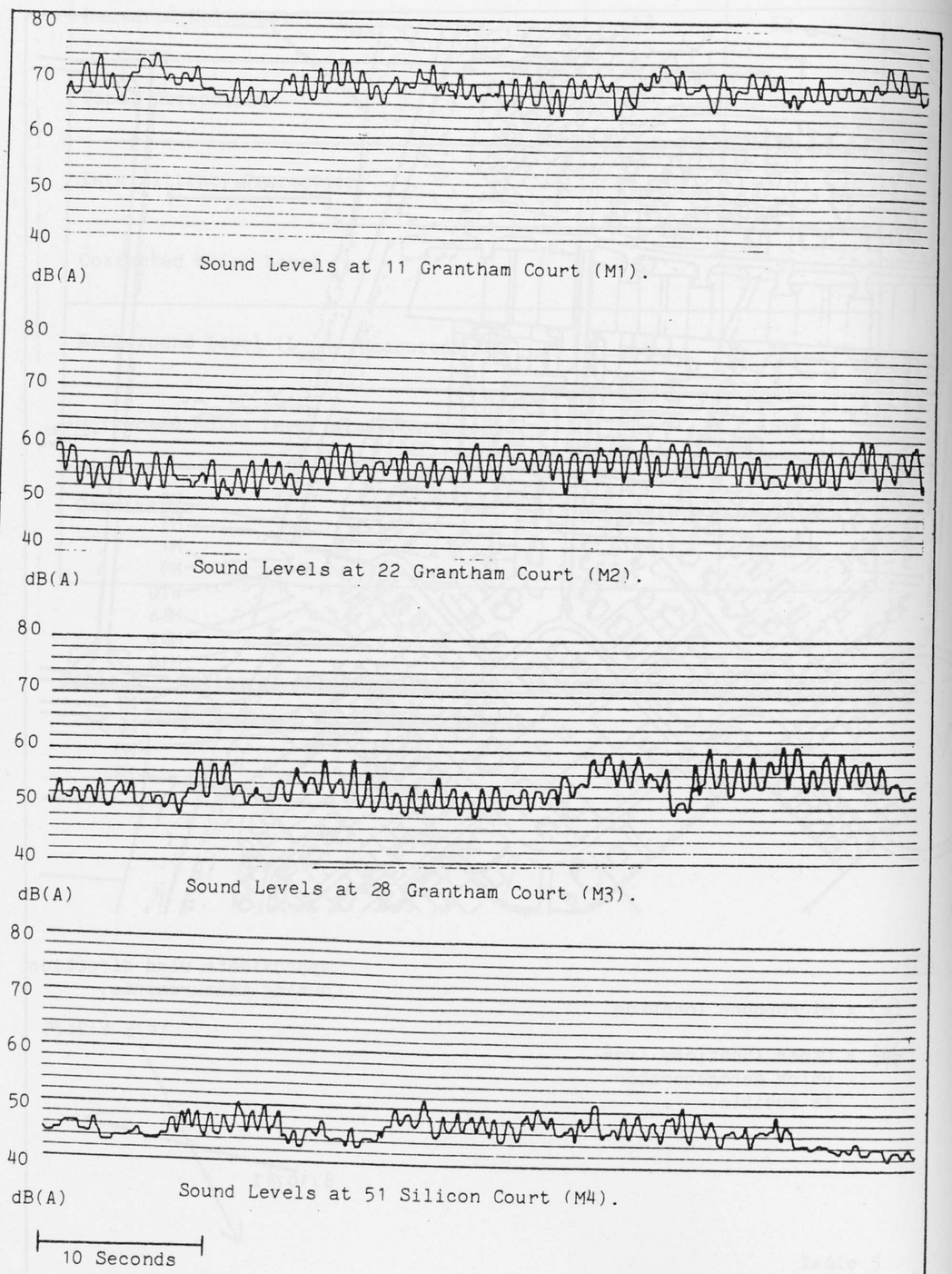


FIGURE 2.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

project	MILTON KEYNES AEROGENERATOR	no.	3323
title	Sound pressure levels at 51 Silicon Court (M4).	date	8 Oct 87

(dB(A) re 20μ Pa)

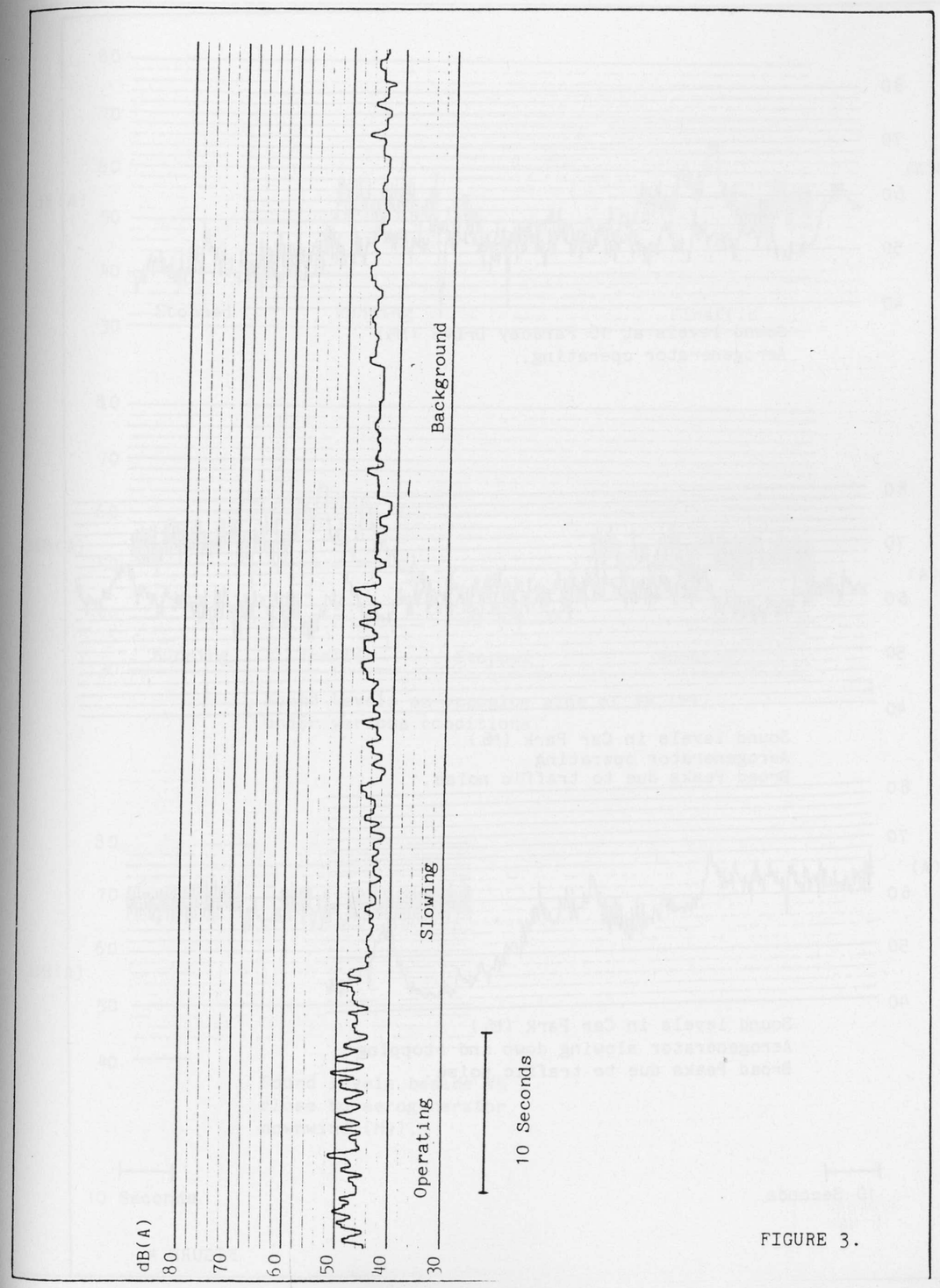
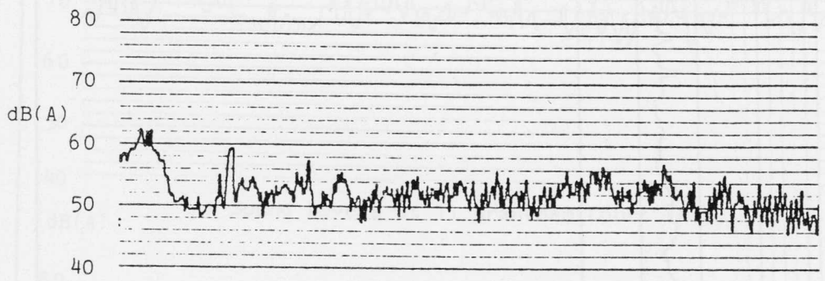


FIGURE 3.

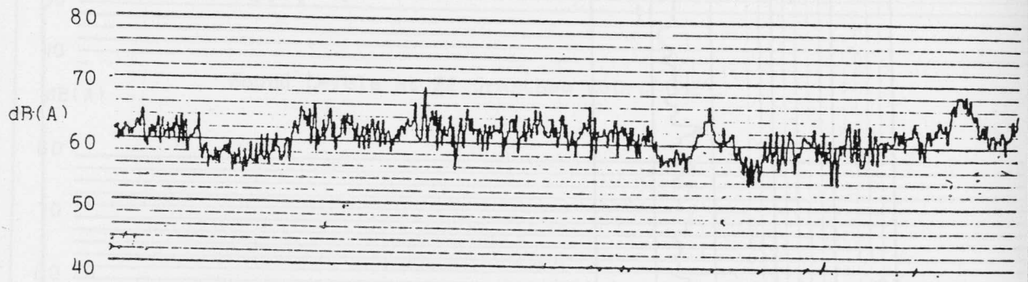
Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

project	MILTON KEYNES AEROGENERATOR	no.	3323
title	Sound Pressure levels at M5 and M6	date	8 Oct 87

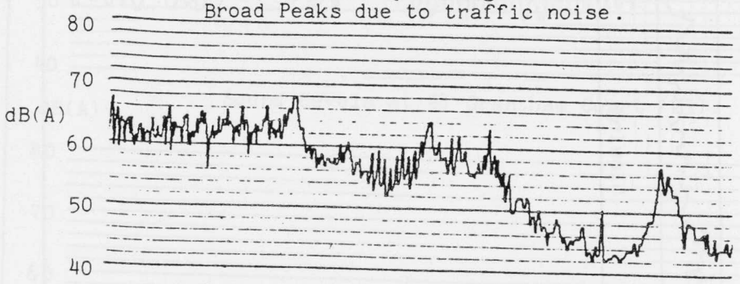
(dB(A) re 20μ Pa)



Sound levels at 10 Faraday Drive (M5)
Aerogenerator operating.



Sound levels in Car Park (M6)
Aerogenerator operating
Broad Peaks due to traffic noise.



Sound levels in Car Park (M6)
Aerogenerator slowing down and stopping
Broad Peaks due to traffic noise.

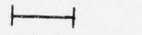
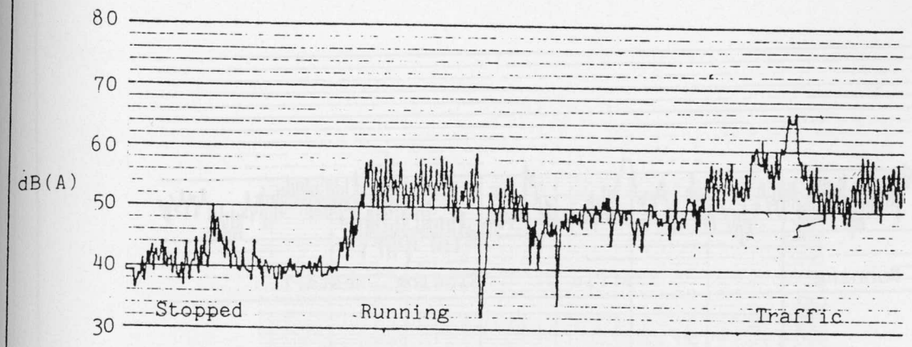


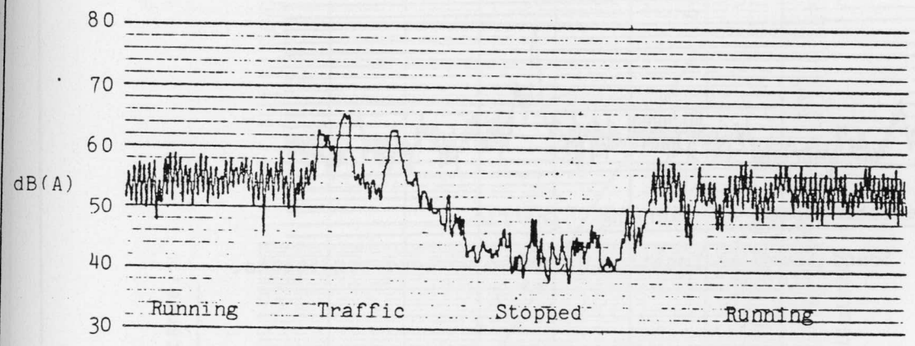
FIGURE 4.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

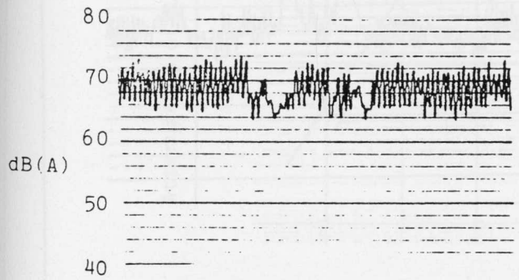
project	MILTON KEYNES AEROGENERATOR	no.	3323
title	Sound pressure levels at M7 and M9	date	8 Oct 87

(dB(A) re 20μ Pa)





Sound Levels on opposite side of V4 (M7)
under various conditions.

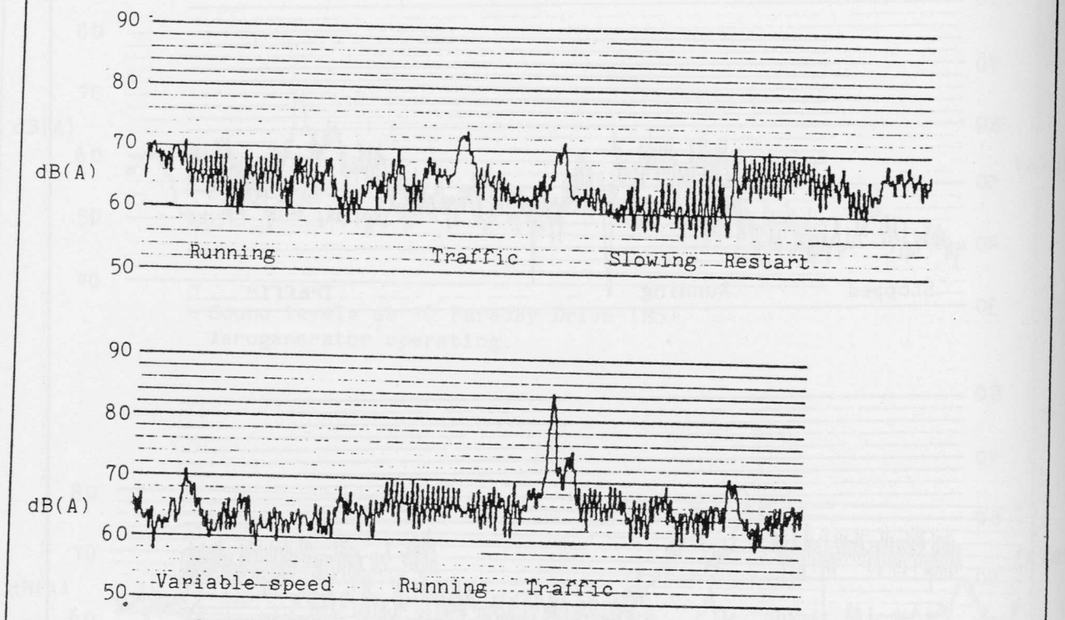


Sound levels beside V4
close to aerogenerator.
downwind (M9).

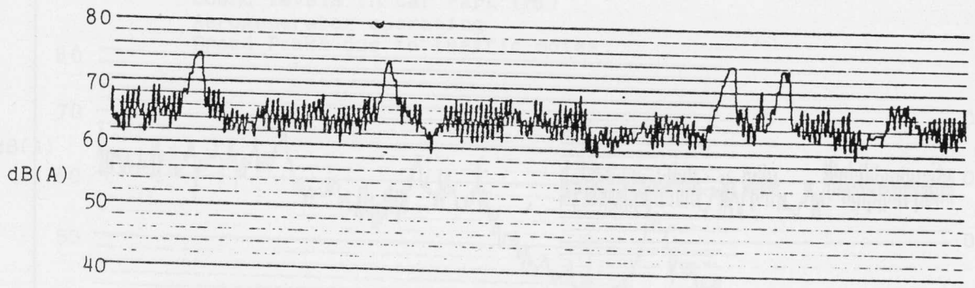
FIGURE 5.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

project	MILTON KEYNES AEROGENERATOR	no.	3323
title	Sound pressure levels at M8a and M8b (dB(A) re 20μ Pa)	date	8 Oct 87



Sound level at location 8a under various conditions.



Sound level at location 8b.
Aerogenerator operating
Peaks due to traffic noise.

10 Seconds

FIGURE 6.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

project	MILTON KEYNES AEROGENERATOR	no.	3323
title	Attenuation of L_{Aeq} with distance.	date	8 Oct 87

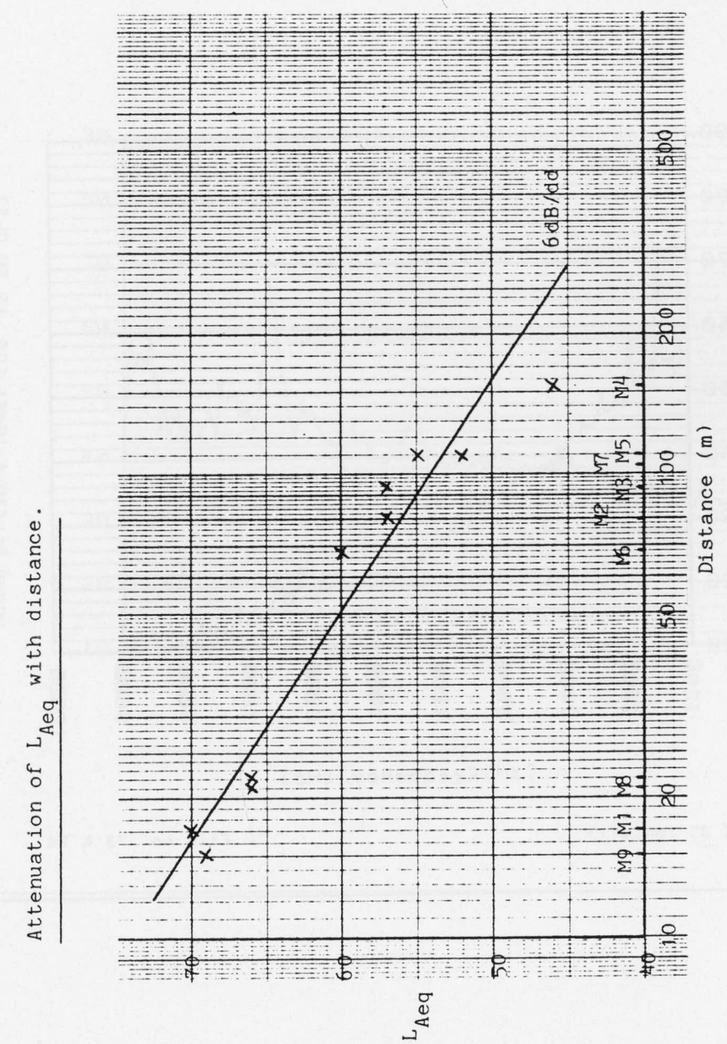


FIGURE 7.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

Project	No.
MILTON KEYNES AEROGENERATOR	3323
Title	Date
11 Grantham Court (M1)	8 OCT 87

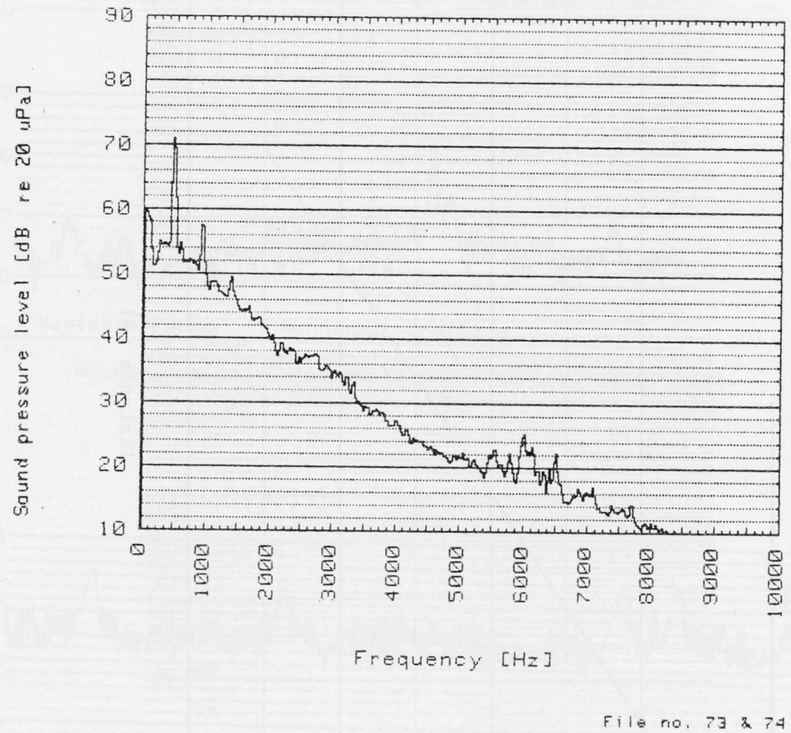


FIGURE: 8.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

Project	No.
MILTON KEYNES AEROGENERATOR	3323
Title	Date
11 Grantham Court (M1)	8 OCT 87

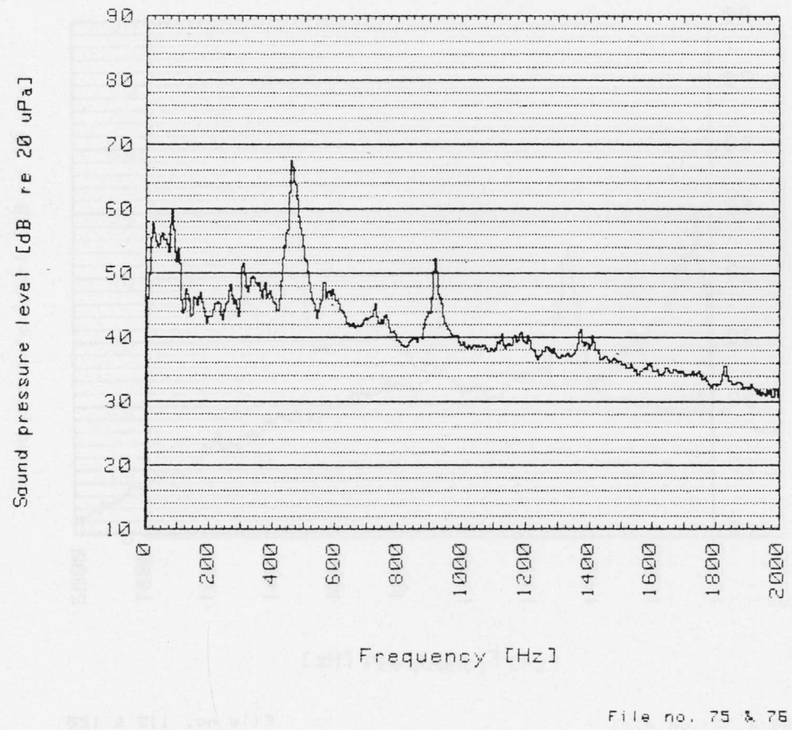
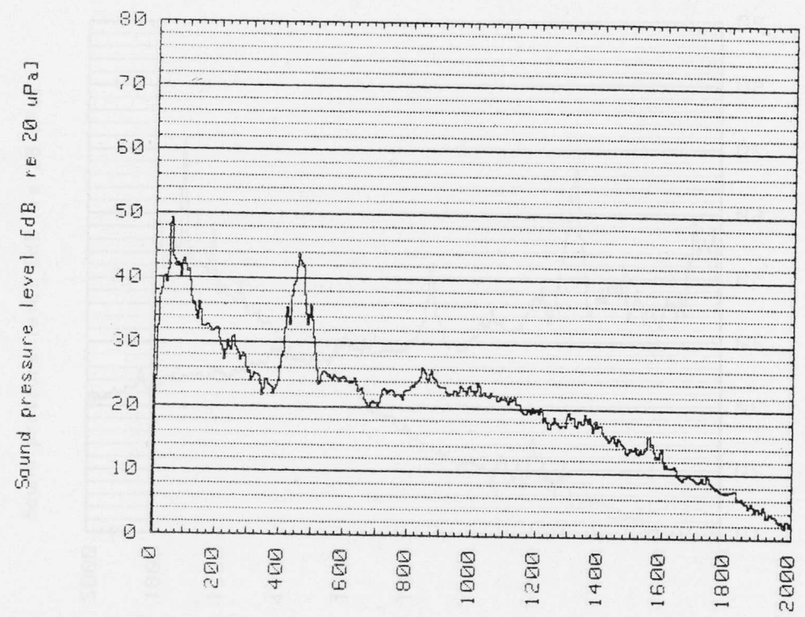


FIGURE: 9.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

Project	No.
MILTON KEYNES AEROGENERATOR	3323
Title	Date
51 Silicon Court (M4)	8 OCT 87

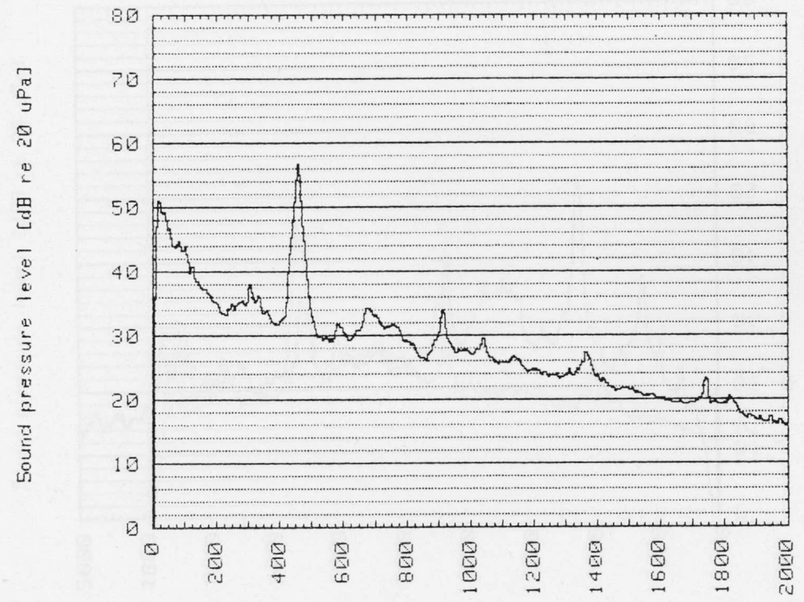


File no. 119 & 120

FIGURE: 10.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

Project	No.
MILTON KEYNES AEROGENERATOR	3323
Title	Date
22 Grantham Court (M3)	8 OCT 87



File no. 87 & 88

FIGURE: 11.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

Project	No.
MILTON KEYNES AEROGENERATOR	3323
Title	Date
28 Grantham Court (M3)	8 OCT 87

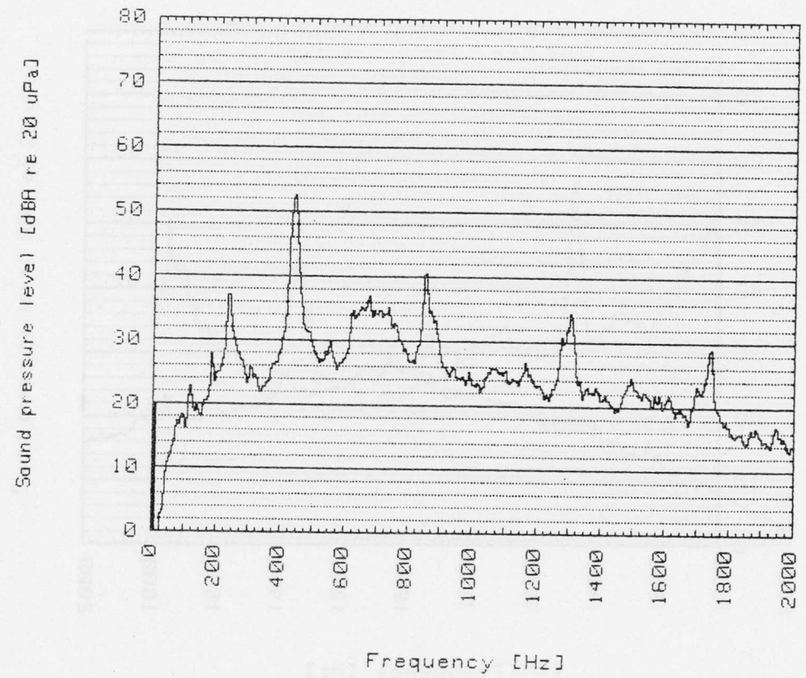


FIGURE: 12.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

Project	No.
MILTON KEYNES AEROGENERATOR	3323
Title	Date
10 Faraday Drive Location (M5)	8 OCT 87

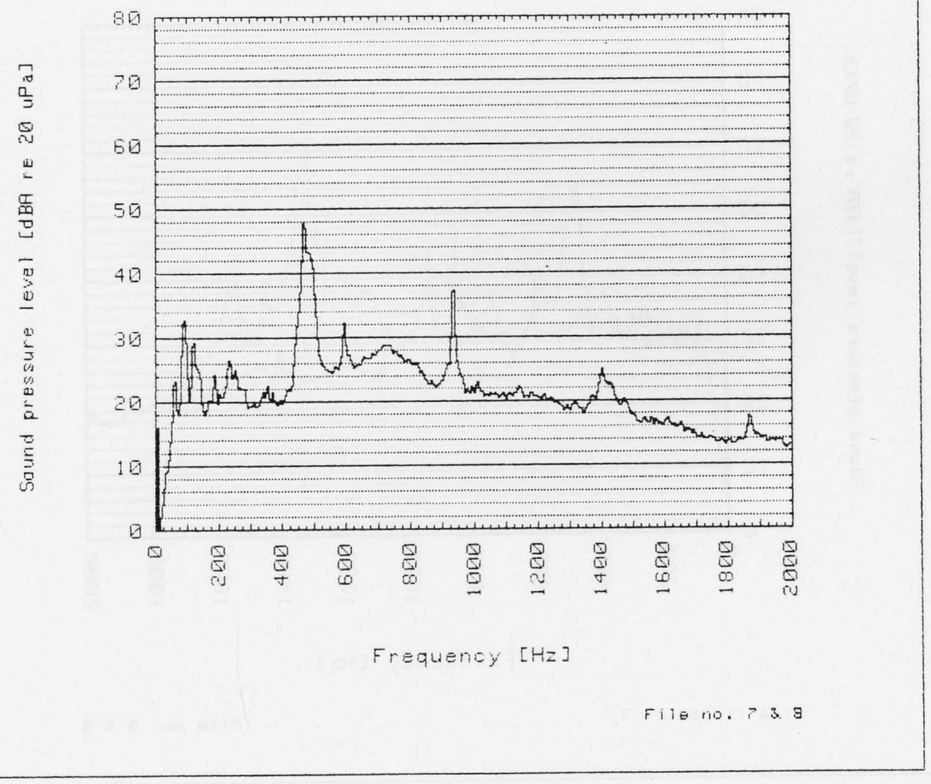
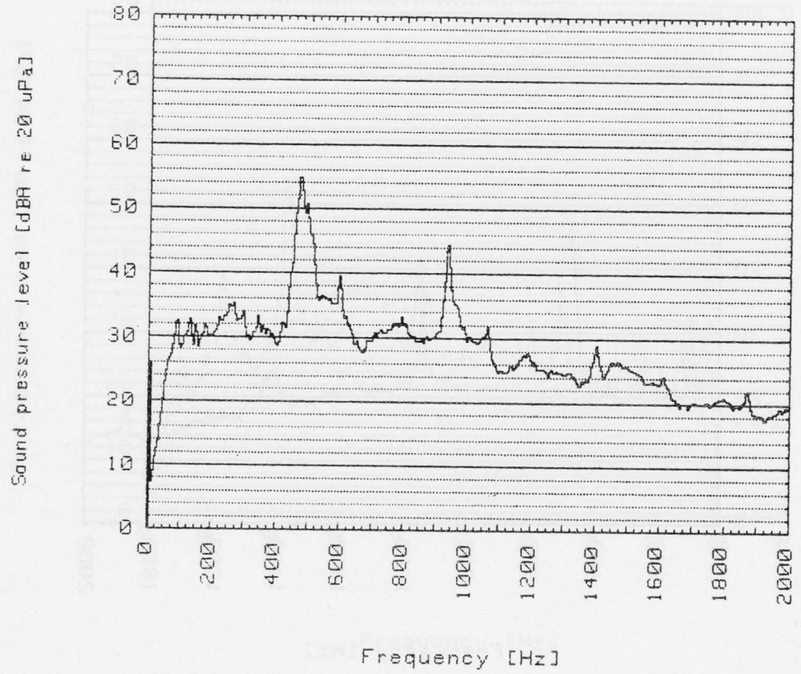


FIGURE: 13.

Wolfson Unit for NOISE & VIBRATION CONTROL

I.S.V.R.

Project	No.
MILTON KEYNES AEROGENERATOR	3323
Title	Date
Faraday Drive Location (M6)	8 OCT 87



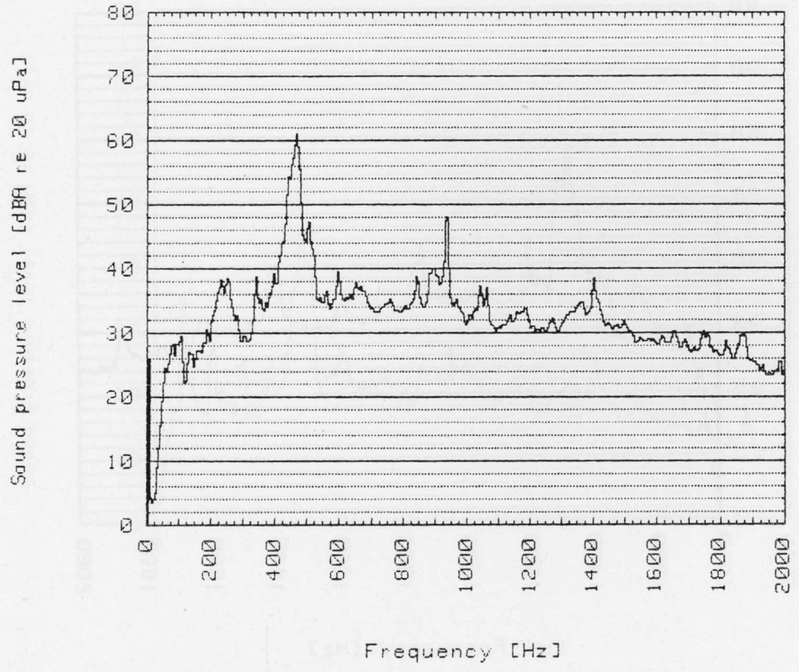
File no. 5 & 6

FIGURE: 14.

Wolfson Unit for NOISE & VIBRATION CONTROL

I.S.V.R.

Project	No.
MILTON KEYNES AEROGENERATOR	3323
Title	Date
Faraday Drive Location (M8a)	8 OCT 87

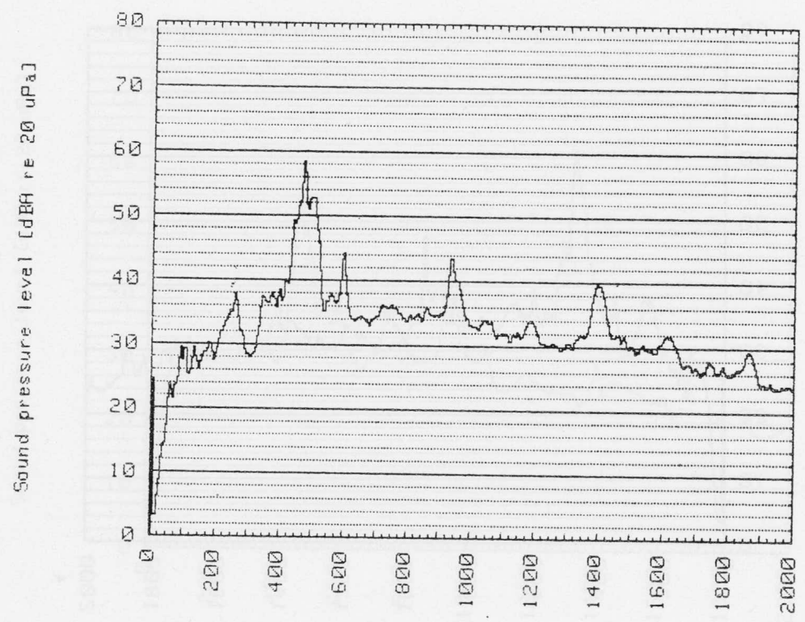


File no. 11 & 12

FIGURE: 15.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

Project	No.
MILTON KEYNES AEROGENERATOR	3323
Title	Date
Faraday Drive Location (M8b)	8 OCT 87

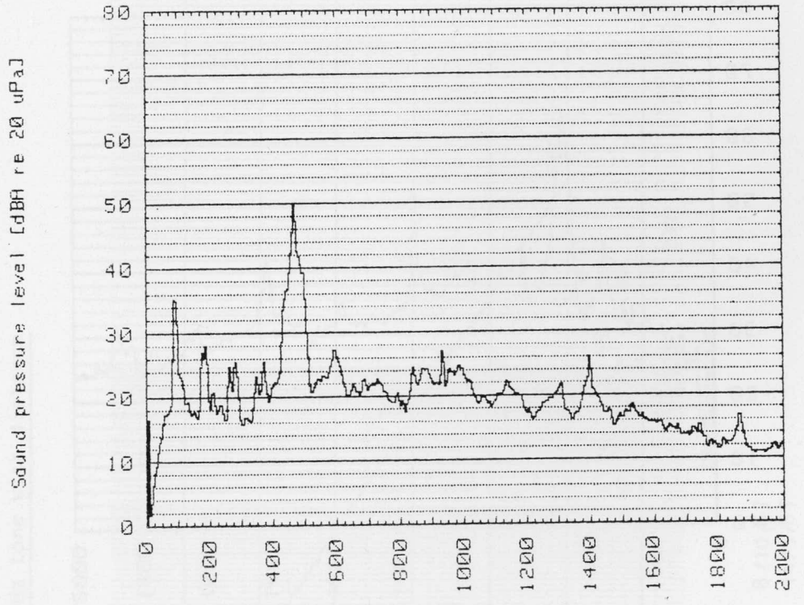


File no. 123 & 124

FIGURE: 16.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

Project	No.
MILTON KEYNES AEROGENERATOR	3323
Title	Date
Across V4 From Aerogenerator.(M7)	8 OCT 87

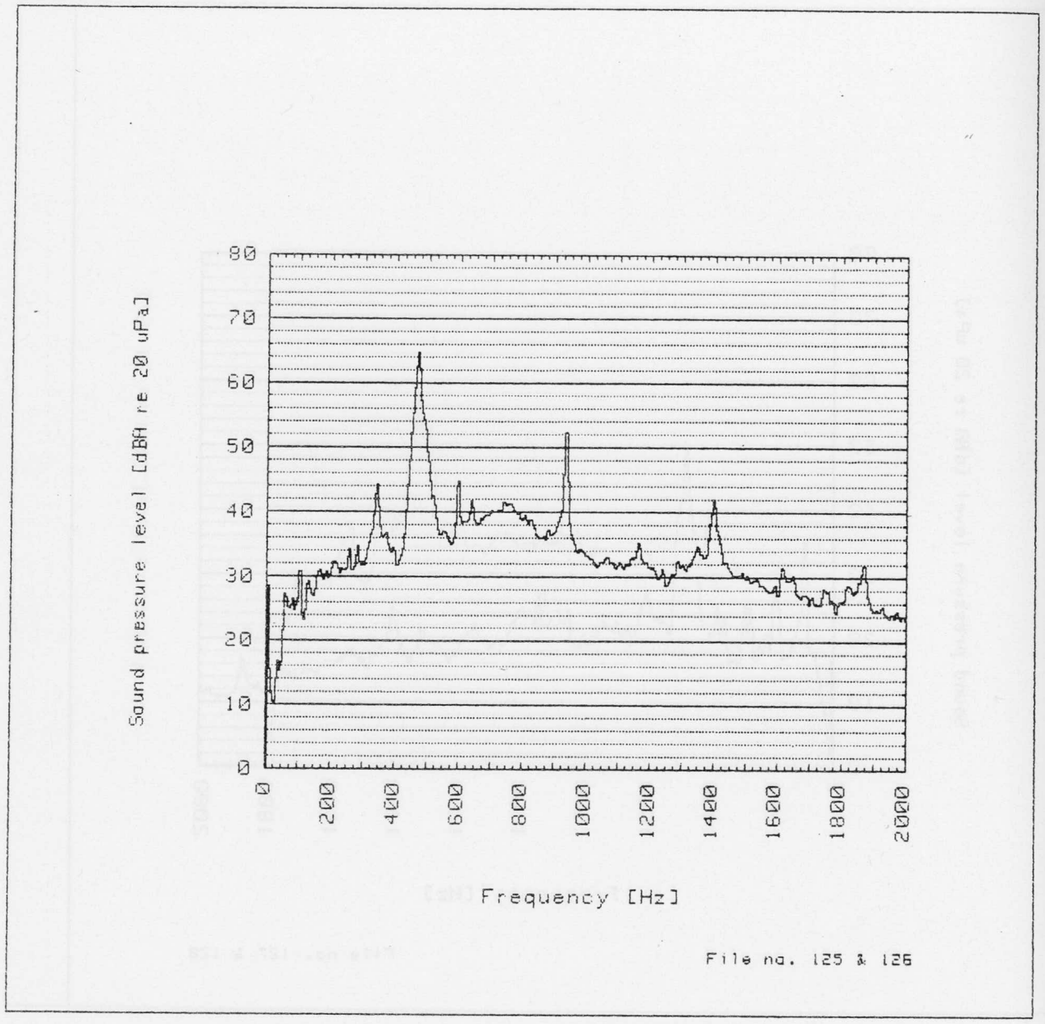


File no. 127 & 128

FIGURE: 17.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

Project	No.
MILTON KEYNES AEROGENERATOR	3323
Title	Date
Alongside V4 (M9)	8 OCT 87



File no. 125 & 126

FIGURE: 18.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

project	MILTON KEYNES AEROGENERATOR	no.	3323
title	Attenuation of 470Hz tone with distance.	date	8 Oct 87

Attenuation of 470Hz tone with distance.

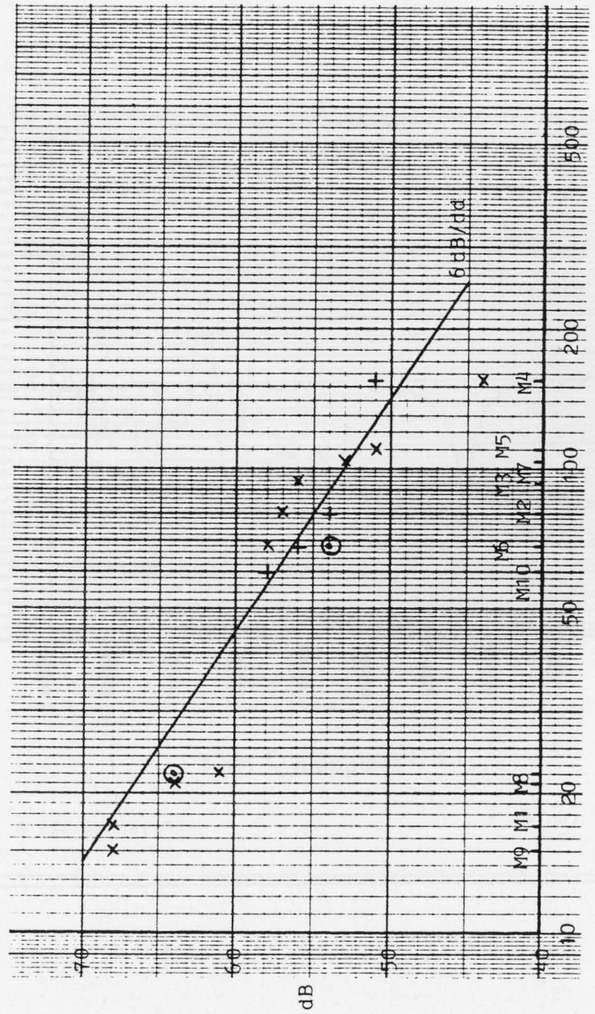


FIGURE 19

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

Project	No.
Milton Keynes Aerogenerator.	3323
Title	Date
White Noise With Notch Filter.	8 Oct 87

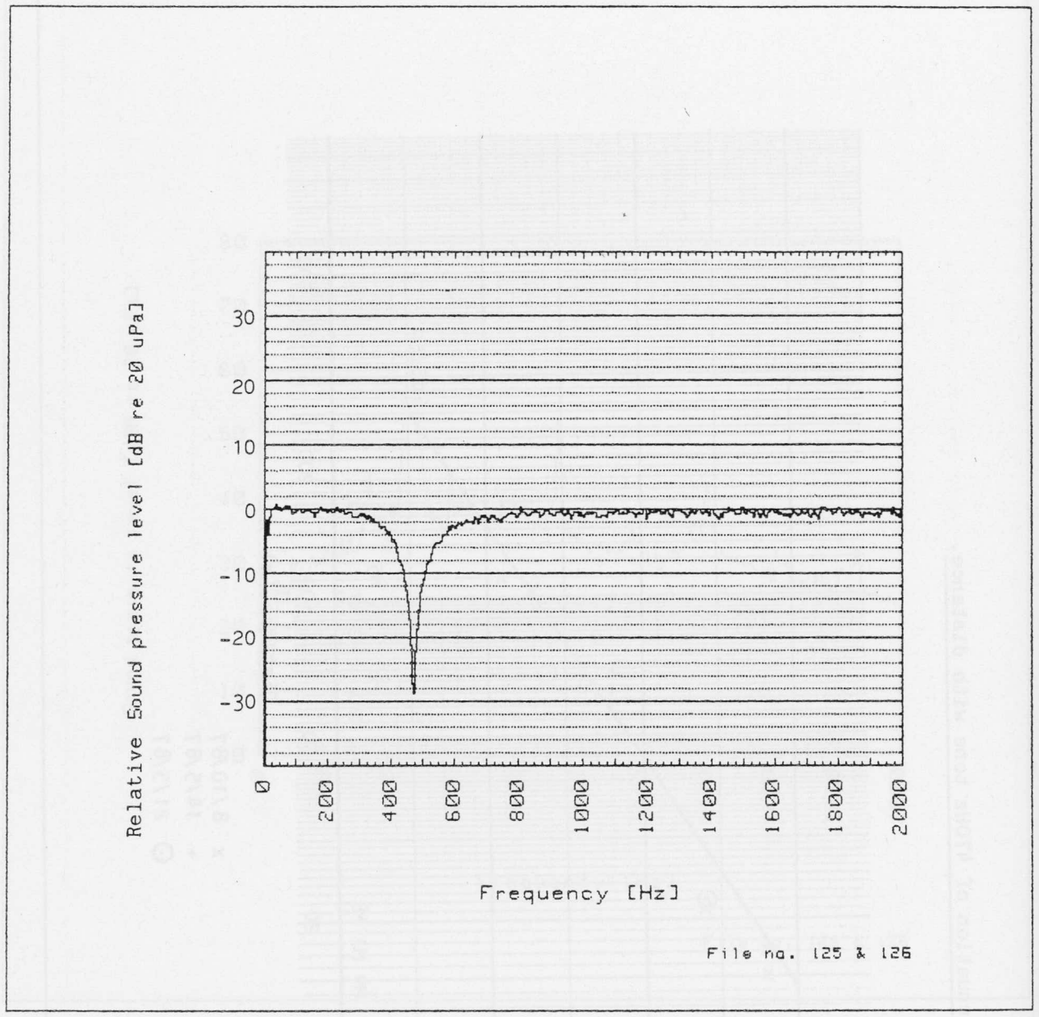


FIGURE: 20.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

Project	No.
Milton Keynes Aerogenerator.	3323
Title	Date
Recording at Location M8b.	8 Oct 87

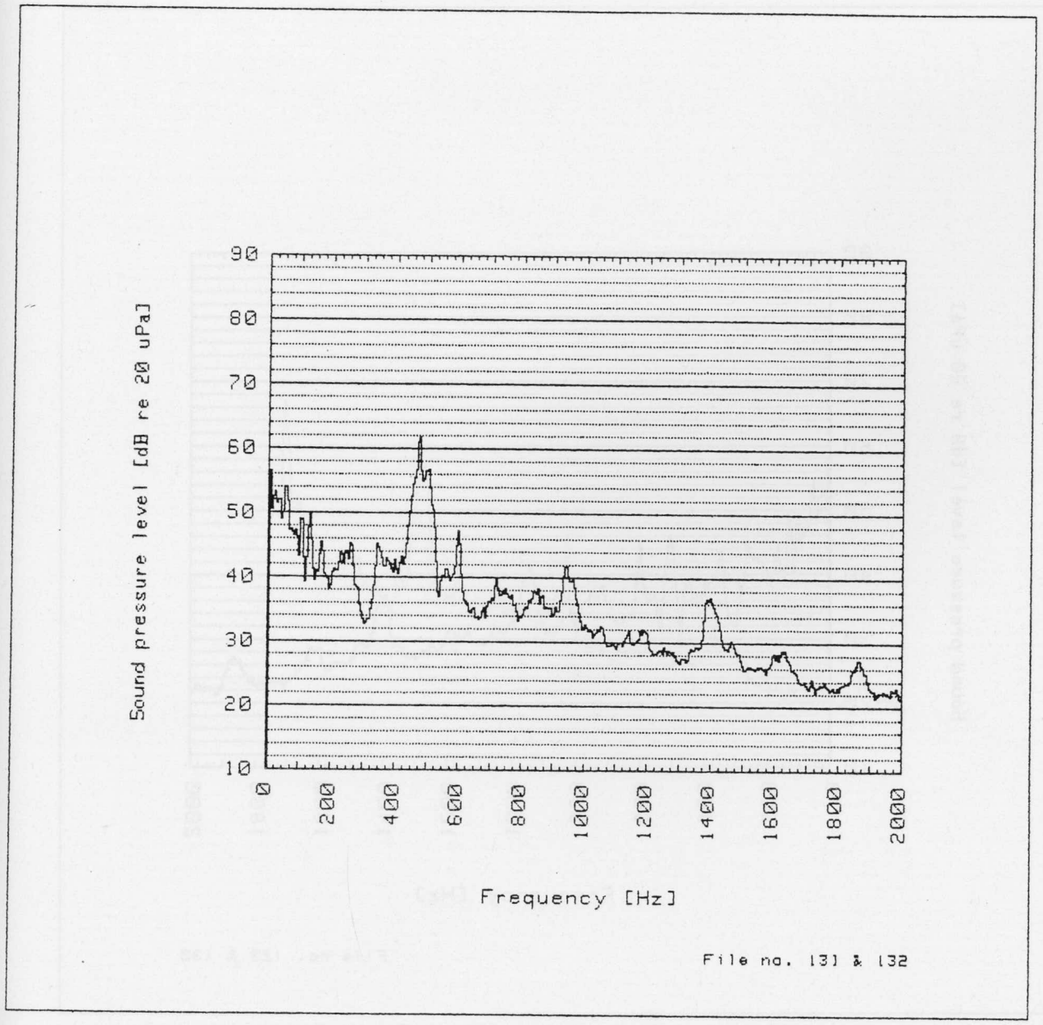


FIGURE: 21.

Wolfson Unit for NOISE & VIBRATION CONTROL

I.S.V.R.

Project	No.
Milton Keynes Aerogenerator.	3323
Title	Date
Location M8b with Notch filter	8 Oct 87

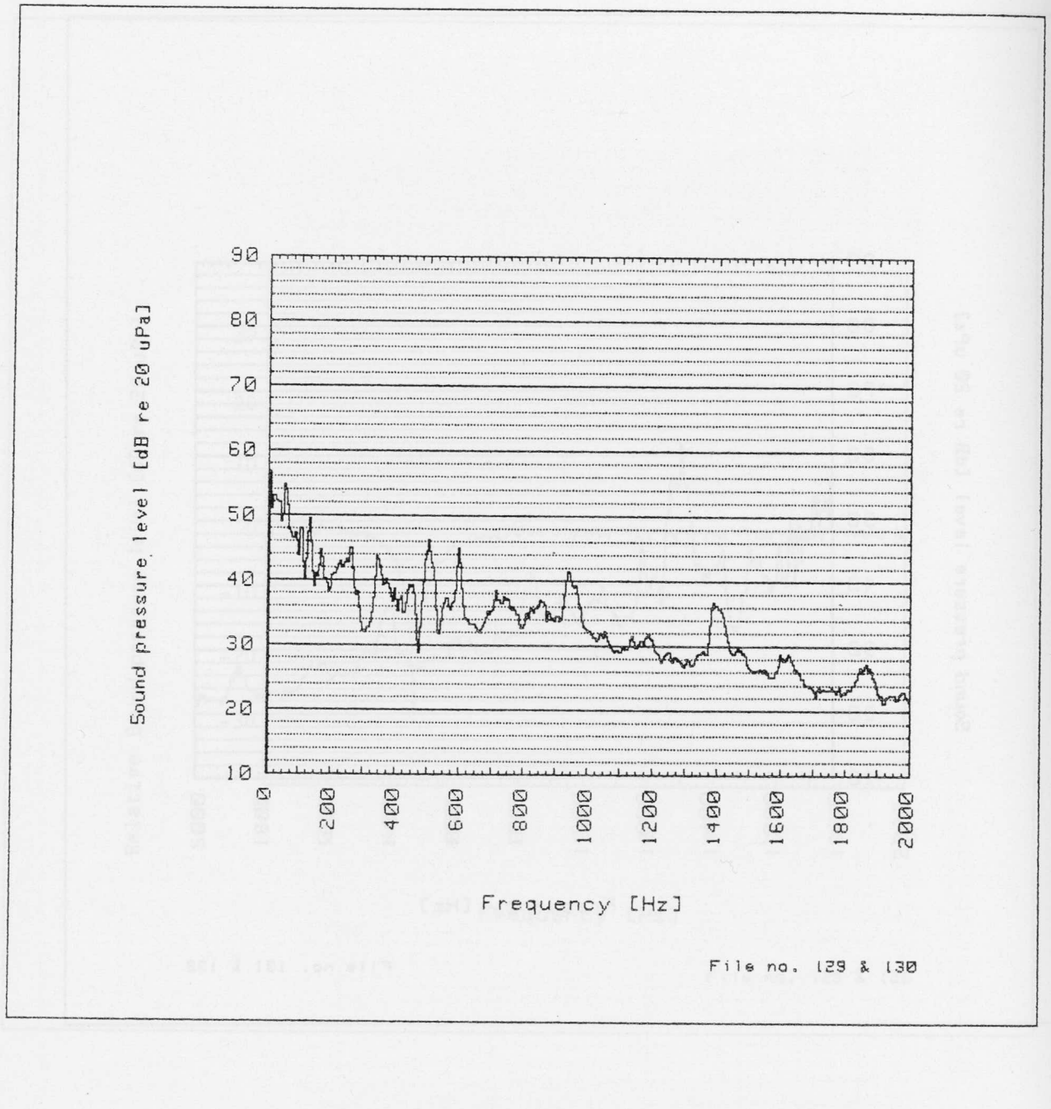


FIGURE: 22.

Wolfson Unit for NOISE & VIBRATION CONTROL

I.S.V.R.

Project	No.
Milton Keynes Aerogenerator.	3323
Title	Date
Recording at 10 Faraday Drive.	8 Oct 87

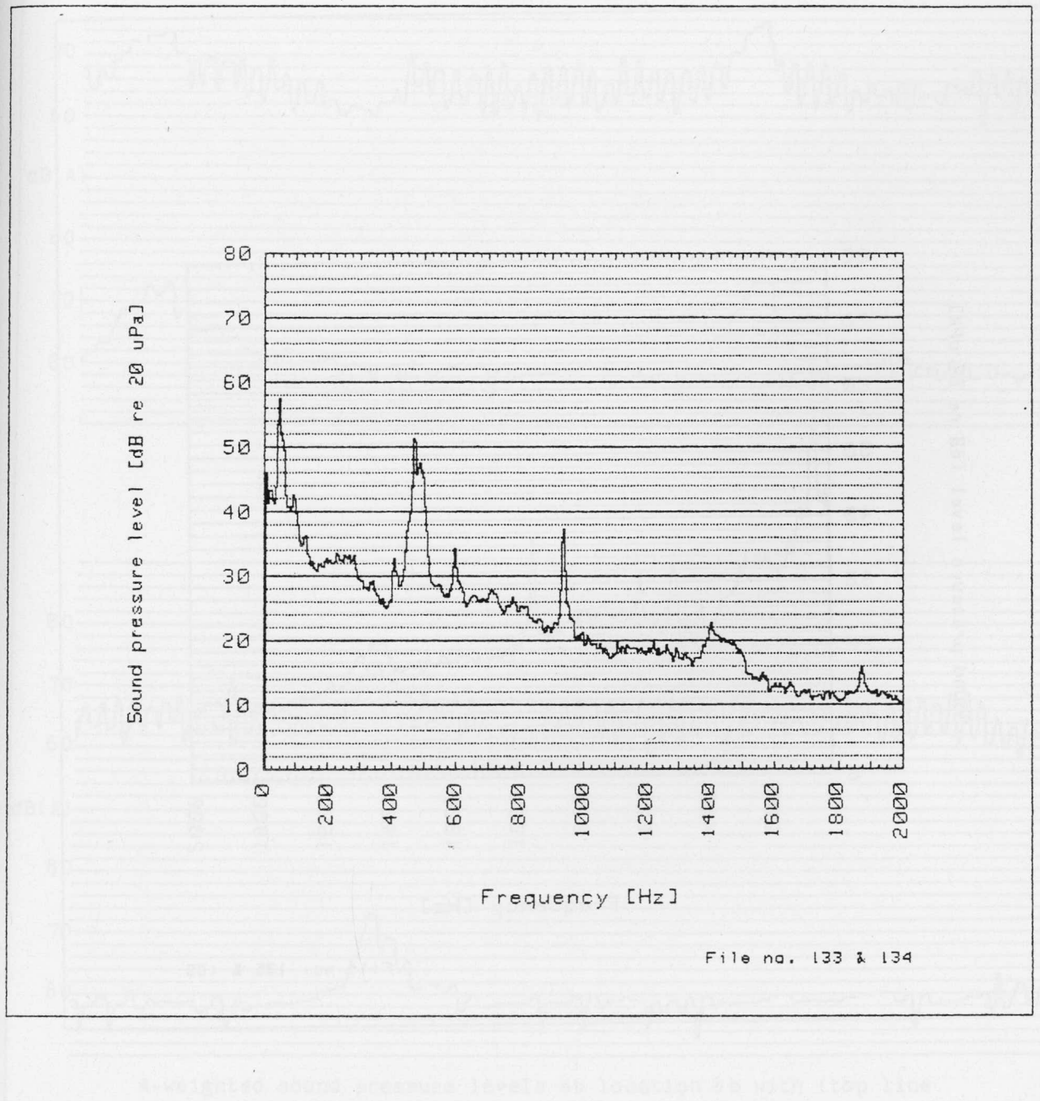


FIGURE: 23.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

Project	No.
Milton Keynes Aerogenerator.	3323
Title	Date
10 Faraday with Notch filter	8 Oct 87

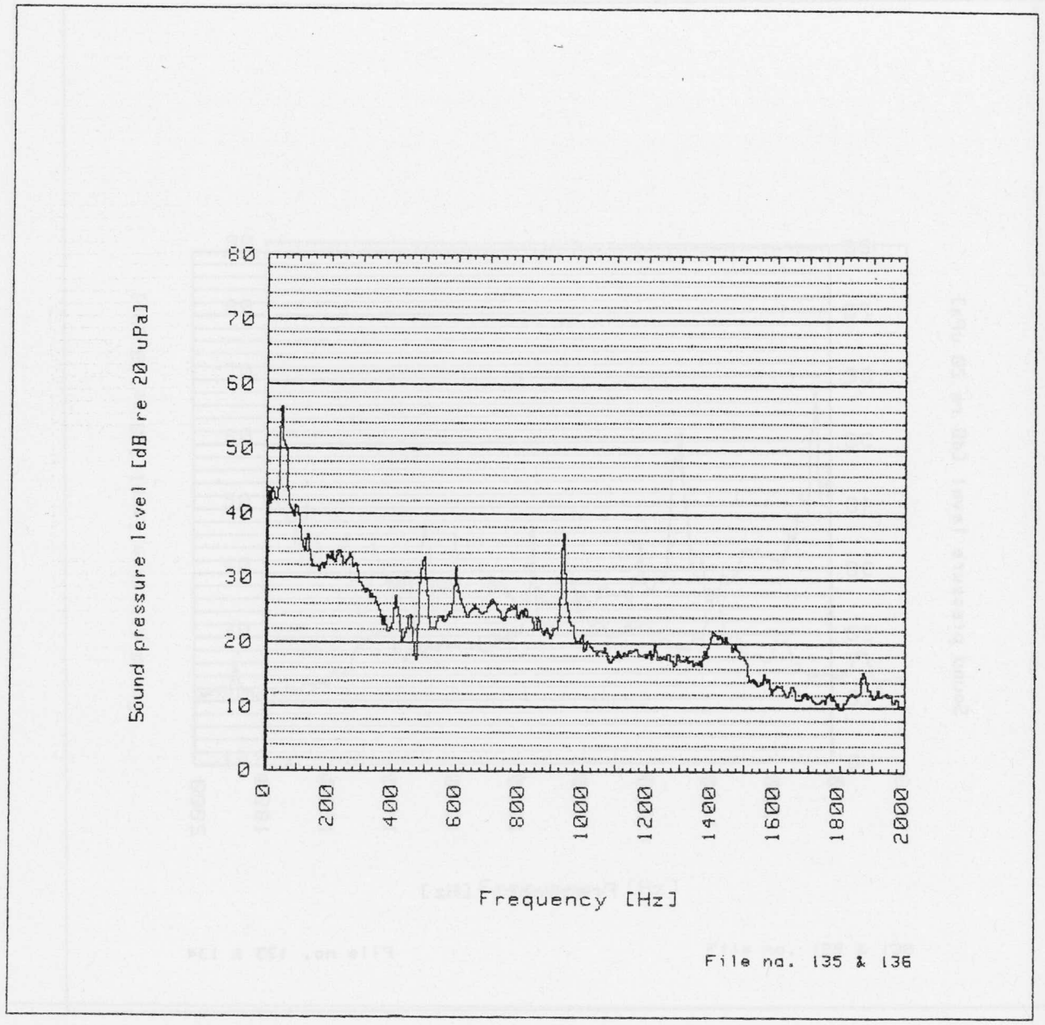
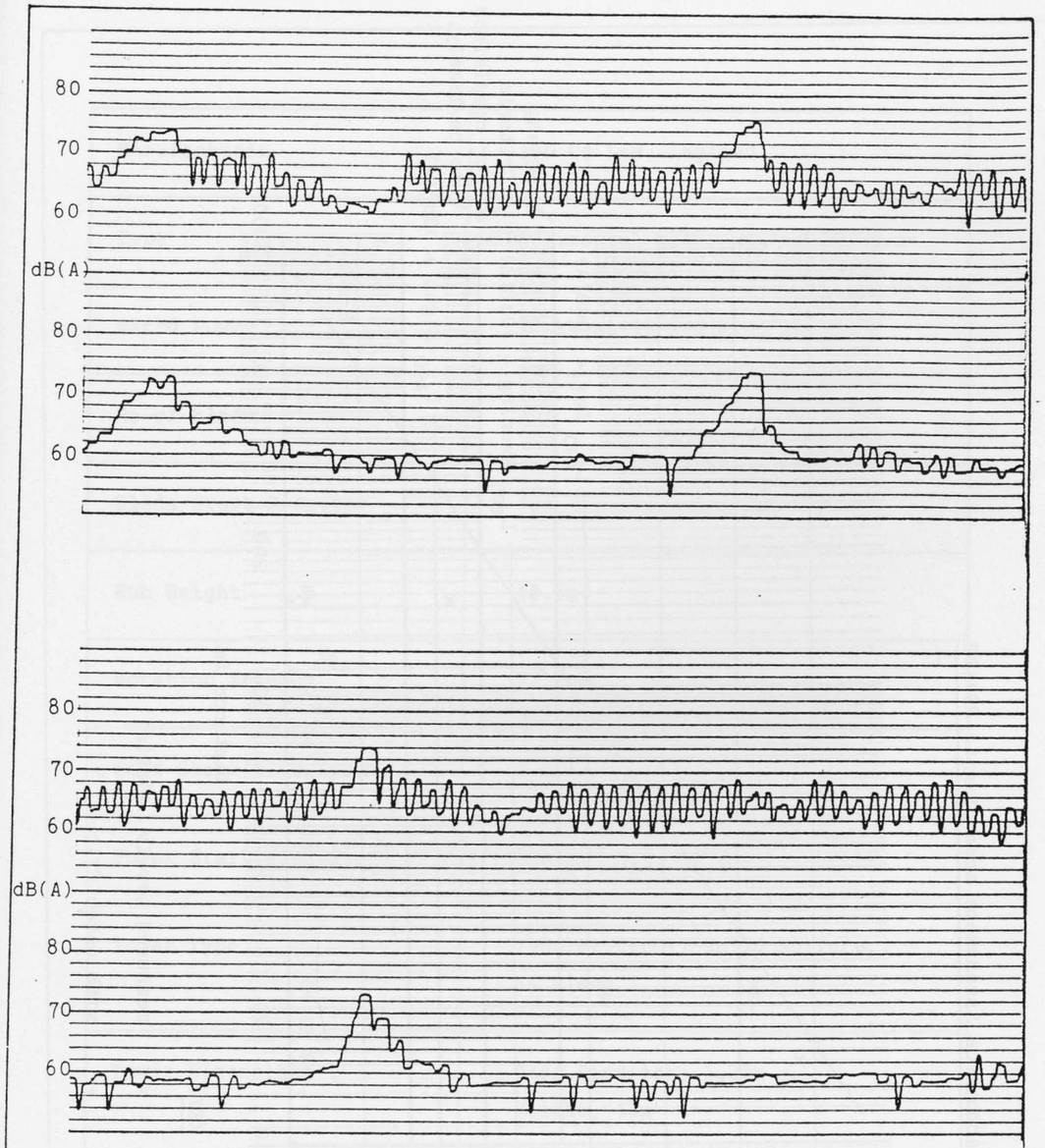


FIGURE: 24.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

project	MILTON KEYNES AEROGENERATOR	no.	3323
title	Effect of Filter on sound levels at Location M8b.	date	8 Oct 87



A-weighted sound pressure levels at location 8b with (top line of each pair), and without, notch filter at 470Hz.

10 Seconds

FIGURE 25.

Wolfson Unit for NOISE & VIBRATION CONTROL
I.S.V.R.

project	MILTON KEYNES AEROGENERATOR	no.	3323
title	Annoyance Assessment according to BS4142.	date	8 Oct 87

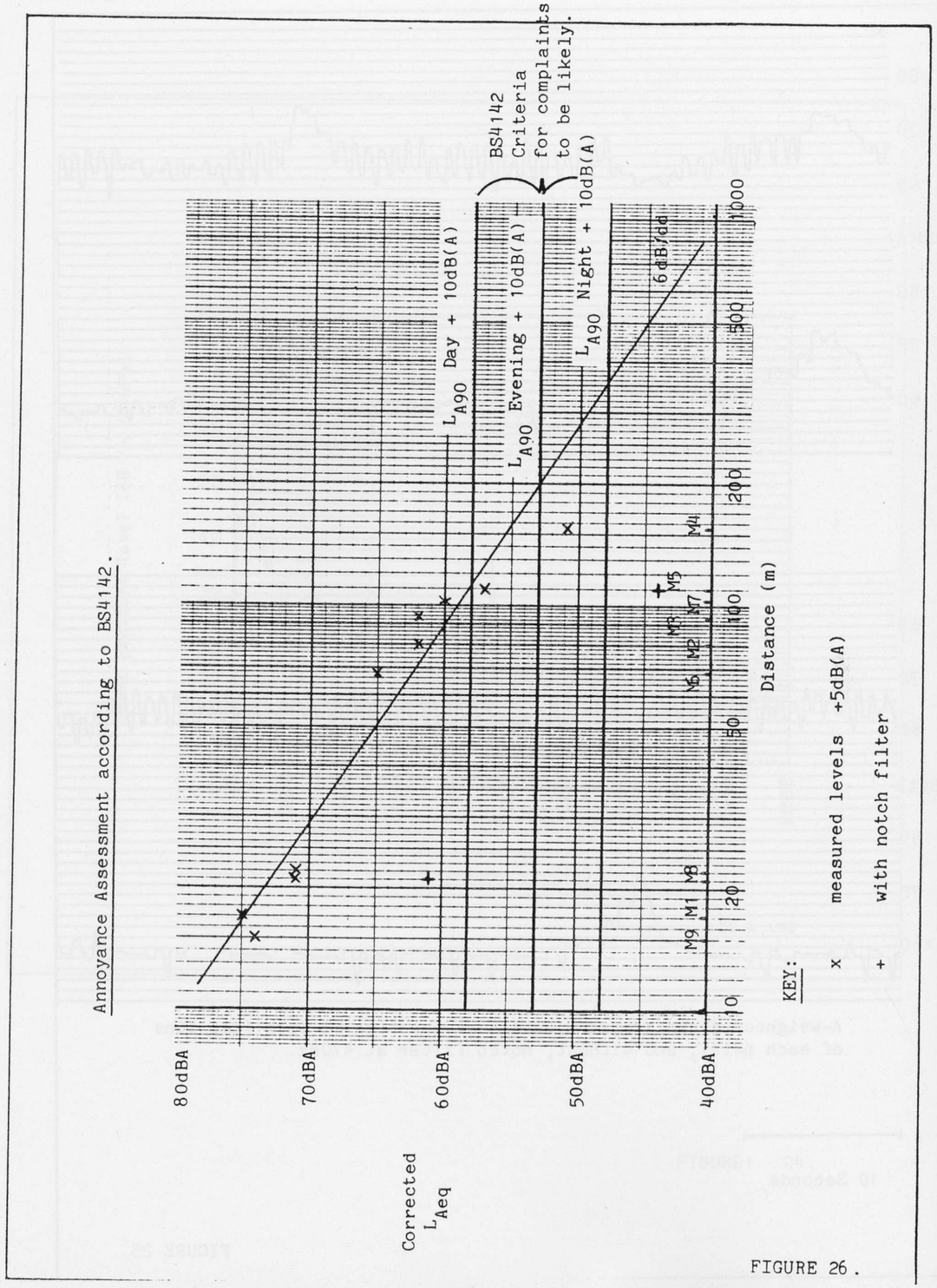


FIGURE 26.

APPENDIX

Aerogenerator Data

Manufacturer	IRD Co Ltd, England
Type	Horizontal axis, upwind of tower
Rated Power	20 kW at 13 m/s wind speed
No of blades	3
Blade Swept Diameter	12m
Hub Height	18.5m
Rotation Speed	72 rpm
Self Start Wind Speed	8 m/s
Power Start Wind Speed	6 m/s
Tower Type	Tubular Steel, Solid Surface, 16 sided
Tower Dimensions	Base Diameter; 1.39m Height; 18m